

Mystery of the Universe:

***Conversing with Dante
in Dream {3}***

Art Aeon

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with Dante in Dream {3}* (2019)

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Mystery of the Universe (2019)

Conversing with Dante in Dream

A Dreamer's Tale One:

Dante's Poem of Light

Tale Two:

Journey of Life on Earth

Tale Three:

Mystery of the Universe

Mystery of the Universe: Conversing with Dante in Dream {3}

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Prologue

Mystery of the Universe: Conversing with Dante in Dream {3}

This work is the final part of a fictional narrative poem in the tercet stanza. It unfolds an imaginary conversation between two characters in a dream: A sincere heathen dreamer and the spirit of his revered poet, Dante (1265-1321): the author of the *Divine Comedy*. It was inspired by the *Divine Comedy* of Dante to follow its form and spirit as much as it may be feasible by a novice.

At the end of the preceding *Journey of Life on Earth: Conversing with Dante in Dream {2}*, the character-Dante asks the character-dreamer critical questions. If the deities have never existed in reality but they are merely inventions of the imaginative human brains as the heathen dreamer insists on, then how the Universe and all things in it could have been working in such exquisite harmony. The dreamer replies that he will try to relate what the human brains have recently discovered by scientific researches on the nature of the Universe and its profound mystery. It is a provisional tale that will evolve with the progress of the science with time. Yet, he hopes that it is a meaningful and soul-searching story for them to converse on.

Mystery of the Universe discusses the following topics in fifteen *Songs* (similar to Dante's *Cantos* of the *Divine Comedy*).

NOTE: The technical terms used in this work are indicated by quotation marks in *italics* (e.g., “gravity,” “proton”, “photon,” “quark”). For their scientific explanations and relevant references, please consult the website of **www.wikipedia.org**.

Song 1: *Movements of the Earth in the Solar System.*

Dante asks where in the Universe we are. The dreamer says that we are on the “*Earth*,” which is one of many moving objects that form the “*Solar System*.” Our Earth is not an immovable center of the Universe: it spins about its north-south axis once every day, while it also revolves around the Sun once every year with other planets, asteroids, and comets of the Solar system. The theory of “*heliocentrism*” against the “*geocentric dogma*,” was published by “*Nicolaus Copernicus*” in 1543. Despite severe condemnations of the Copernican heliocentrism by the Vatican, it was upheld by brave scientists such as “*Johannes Kepler*” and “*Galileo Galilei*.” Eventually, it inspired “*Isaac Newton*” to formulate the “*fundamental laws of motion*” and the “*theory of universal gravitation*” in 1687.

Song 2: Newton's Laws of Motion and Theory of Universal Gravitation, and Rules of Reasoning

Newton's "*Mathematical Principles of Natural Philosophy*" formulated the fundamental laws of motion and the theory of universal gravitation.

Law I: "*Every body persists in its state of being at rest or moving uniformly straight forward, except insofar as it is compelled to change its state by force impressed.*"

Law II: "*The alteration of motion is ever proportional to the motive force impressed; and is made in the direction of the right line in which that force is impressed.*"

Law III: "*To every action there is always opposed and equal reaction. Or the mutual actions of two bodies upon each other are always equal and directed to contrary parts.*"

The Theory of Universal Gravitation: "*Every particle attracts every other particle in the Universe with a force which is directly proportional to the product of their masses and inversely proportional to the square of the distance between their mass-centers.*"

These Newton's formulations brought forth empirical scientific investigations of the nature of things and their motions and predicted future events in the Universe. The classical theory of Newtonian mechanics has described and predicted remarkably well almost all

macroscopic phenomena observed in the sky and on the Earth. Despite its success, however, Newton admitted in the last edition of his "*Principia*" in 1726: "*I have not been able to discover the cause of these properties of gravity from phenomena, and I feign no hypotheses...It is enough that gravity does exist and acts according to the laws I have explained, and that it abundantly serves to account for all the motions of celestial bodies.*"

To prevent our misunderstanding of any scientific theory, Newton professed "*Rules of Reasoning in Philosophy*":

Rule 4. "*In experimental philosophy we are to look upon propositions inferred by general induction from phenomena as accurately or very nearly true, notwithstanding any contrary hypothesis that may be imagined, till such time as other phenomena occur, by which they may either be made more accurate, or liable to exceptions.*"

Song 3: *On the Nature of Stars in the Sky.*

Dante asks what enables a star to shine light. The dreamer responds: If the initial total "*mass of gaseous interstellar molecular clouds*" exceeds a critical value of about one-eighth of the mass of the Sun, their elements begin to condense due to their gravity. Gradually the "*nebula*" becomes a dense spheroidal object: "*proto-star.*" When its central core reaches the critical high temperature and pressure,

“hydrogens” begin to *“transmute”* into another element *“helium”* via *“thermonuclear fusion”* at its core. This subatomic process produces a tremendous amount of energy, some of which radiates as lights. The *“energy-generating nuclear fusion,”* called *“the main sequence,”* is enhanced by itself to keep on once it is initiated by the gravity as long as the star’s reservoir of fuels lasts.

Each star’s initial mass is the crucial factor that determines the course of its *“stellar evolution”* and *“eventual fate.”*

Song 4: *On the Nature of Matter and Energy.*

Dante asks what *“matter”* is. The dreamer responds: There are two kinds of *“fundamental entities”* of nature: *“Substance”* and *“force”* that interact with the substance. Two or more identical substances, called *“fermions,”* cannot occupy the same *“quantum state”* simultaneously, obeying the *“exclusion principle,”* formulated by *“Wolfgang Pauli”* in 1925. In contrast, the physical carriers of *force*, called *“bosons”* are free from the exclusive restriction. The carrier of the *“electromagnetic forces,”* called *“photons,”* are *bosons* that interact with *fermions*. The carrier of *“strong nuclear forces”* that bind *“elementary fermions,”* called *“quarks,”* to form *“protons”* and *“neutrons”* in the *“nucleus”* of an *“atom”* is a *boson*, called *“gluon.”*

The carrier of the “*weak nuclear forces*” that make the atomic nucleus to undergo “*transmutations*” to become different elements via “*radioactive decays*” are carried out by massive “*gauge-bosons*,” called “ W^+ ” and “ W^- .”

The “*ordinary matter*” and its corresponding “*anti-matter*” with opposite electric charges are composed of *fermions* by mutual interactions, mediated by “*force-carrying bosons*.” According to the “*Standard Model*” of the current physics, *fermions* are classified into two fundamental families: “*Hadrons*” and “*leptons*.” *Hadrons* are “*composite fermions*” made of two or more “*quarks*,” which are bound together by the “*strong nuclear forces*,” mediated by *gluon*. “*Leptons*” are “*unitary fermions*,” which are not involved in the “*strong nuclear interaction*,” but they are subjected to the “*weak nuclear interaction*,” “*electromagnetism*,” and “*gravitation*.”

The various “*elementary particles*” had been predicted by mathematical theories, and their actual existence was detected by concrete experiments with powerful “*elementary particle accelerators*.”

Song 5: *The Structure of the Observed Part of the Universe*

Dante asks where in the Universe our Solar System is. The dreamer responds: the “*Solar System*” is a tiny part of “*the Milky Way Galaxy*”: It has about three hundred billion stars, many “*exoplanets*” which orbit their stars, and other invisible objects.

The *Solar system* is located on the inner edge of the spiral of matters, called “*Orion-Cygnus Arm*” at about 27,000 “*light-years*” away from the center of the Milky Way galaxy. The galactic center contains a “*supermassive black hole,*” which is estimated to be four million times of the Sun’s mass. Our Solar System revolves around the galactic center with its “*orbital period*” of about 240 million years.

Scientists discovered that stars at a wide range of distances from the galactic center orbit it at a constant speed. Because this phenomenon contradicts the laws of motion and gravity, they postulate that there must exist invisible “*dark matter,*” which interact with ordinary matter only gravitationally, neither emitting nor absorbing electromagnetic radiation. According to the “*Dark Matter Hypothesis,*” about 90% of the Milky Way Galaxy’s mass must be attributed to the unseen “*dark matter.*” But we know nothing about the real physical nature of presumed “*dark matter*” at all.

A cosmic structure composed of many hundreds to thousands of galaxies that are bound together by gravity is called a “*Cluster of galaxies.*” The collection of many galactic “*Clusters*” form a greater cosmic structure, called “*Supercluster of Galaxies.*” We belong to a local *supercluster*, named “*Laniakea,*” which harbours our Milky Way and a hundred thousand other nearby galaxies, gathered in the extent of five hundred million light-years. The observed Universe is estimated to be composed of many millions of such “*Superclusters of galaxies.*”

Song 6: *Current Hypotheses on the Origin and Evolution of the Universe.*

The discovery by “*Edwin Hubble*” that the whole structure of the Universe was changing in a dynamic expansion rather than staying in a static equilibrium state inspired scientist to formulate theories on the origin and evolution of the Universe. “*Georges Lemaitre*” postulated that at a definite point of time in the past, the Universe happened to exist (or born) as a tiny “*primeval atom,*” which has expanded since its birth. According to the so-called “*Big Bang*” hypothesis, the Universe was not born in a “*pre-existing space at a pre-existing time-frame,*” but the “*space*” began to emerge and the “*time*” began to flow through the Universe only after its “*birth*” as the “*Big Bang*” event.

The cosmic life-story of the Universe may be conjectured by mathematical extrapolations as follows: (1) The "*Big Bang*" event occurred at the origin of time's flow at $t^*=0$ about 13.8 billion years ago. (2) During the "*Planck epoch*," our currently known laws of physics are not valid to describe such an extraordinary state of the newly born Universe. (3) In "*Grand unification epoch*," the four kinds of known "*fundamental inter-actions*" or "*forces*" began to emerge; first, the "*gravity*," then the "*strong nuclear force*," the "*weak nuclear force*," and the "*electromagnetic interactions*." (4) The dense and hot young Universe rapidly expanded at an exponential rate during the "*Inflationary epoch*." Its size increased enormously, and its temperature quickly decreased. (5) During the "*Quark epoch*" between a pico- and nano-second after its birth, the Universe was filled with a dense "*quark-gluon plasma*," which was too hot to form the matter at this stage. (6) During the next "*Hadron epoch*" between a nano- and one second after its birth, "*protons*" and "*neutrons*" were formed by sets of three *quarks* bound by *gluon*. (7) During the "*lepton epoch*" between one and ten-second, "*electrons*" and "*neutrinos*" were formed. (8) During the "*proto-nucleosynthesis epoch*" between ten seconds and twenty minutes after the *Big Bang*, *protons* and *neutrons* began to form light *atomic nuclei*. (9) During the "*Photon epoch*" between 20 min and 380 thousand years after the *Big Bang*, the Universe

gradually cooled down so that the atomic nuclei could combine with *electrons* to form stable “*neutral atoms.*” *Photons* were freed from interacting with matter as the previously opaque “*plasma of atomic nuclei, electrons, and photons*” disappeared slowly. The Universe became transparent, and photons propagated freely to become the “*cosmic microwave background radiation.*” (10) During a long “*Dark epoch*” between 380 thousand and 150 million years after the *Big Bang*, vast clouds of “*hydrogen molecules*” dominated. Still, they were not concentrated enough by gravity to form *proto-stars* as yet. (11) During the “*Reionization epoch*” between 150 million to one billion years after the *Big Bang*, neutral hydrogen molecules became “*ionized plasma*” by gravity, and the “*large-scale comic structures and stars*” emerged. (12) During the “*Galaxies Formation and Evolution epoch*” from one to ten billion years after the *Big Bang*, many stars became bound by gravity to form a galaxy; many galaxies into a *galaxy-cluster*; and many *galaxy-clusters* evolved to create a *supercluster of galaxies*.

Song 7: *Questions on the “Big Bang” Hypothesis.*

The dreamer confesses that he cannot believe that the alleged “*Big Bang*” happened as a real physical event. He argues that “*Big Bang*” is a story of magical creation of the Universe from nothing

(*Creatio ex nihilo*), which violates the “*fundamental principle of the conservation of energy and matter*.” The “*Big Bang*” hypothesis is based on the alleged “*Expansion of the Universe*.” But the expansion is indirectly inferred from the “*red-shift*” in the spectrum of wavelengths of light. The observed *red-shifts* can be interpreted in various ways: It may be due to the receding movements of the distant astronomical objects which emitted the photons (as “*Doppler effect*”). But the “*red-shift*” may be due to a decrease in the photons’ energy, which travelled via galactic medium.

Even if we assume that the presumed *expansion of the Universe* is correct, the *Big Bang* hypothesis has a severe logical problem. It makes a blind extrapolation of the supposed expansion of the Universe reversely in time back to its unknown origin, as if its expansion had started from, and continued since that point of time. But we cannot know when the expansion began, and how long it has been going on.

Song 8: “*Ex Nihilo, Nihil Fit*.”

The dreamer professes his private opinions according to his belief in “*Ex nihilo, nihil fit*”:

[A] Postulate 1. The “*Universe*” is defined by its total constituent “*matters*” and “*energy*.” They are distributed in specific patterns in “*space*,” and by the particular changes in such patterns through the flow of “*time*,” in accord with its own specific set of “*principles*” or “*laws of nature*.”

[B] Postulate 2. The Universe consists of many separate parts of two kinds, each called “*world*”: an “*ordinary world*” is made of “*fermions*”; an “*anti-world*,” made of “*anti-fermions*.”

[C] The particular part of the Universe, which has been observed by the humans on Earth, is a concrete example of an “*ordinary world*” which consists of many million “*super-clusters*” of galaxies, made of fermions. The apparent lack of any galaxy which is made of *anti-fermions* in the observed part of the Universe suggests that its corresponding “*anti-world*” may be separated too far from us, beyond the reach of our current ability of its detection.

[D] Let us suppose that the Universe has only one “*ordinary world*” and its corresponding separate “*anti-world*.” When these two “*worlds*” become “*ionized plasmas*,” the strong electrically attractive force between them will significantly increase the probability of their collision, and hence their “*mutual annihilation*” into “*radiative energy*.”

[E] As pairs of collided “matter” and “anti-matter” become annihilated at various levels such as subatomic, atomic, molecular, stellar, galactic, and super-clusters of galaxies scales, the Universe will appear to contract, and the density of radiative energy will increase immensely. Consequently, its temperature will rise to an extremely high level.

[F] Hence, the cosmic collision between the “*ordinary world*” and the “*anti-world*” will produce the extreme physical conditions which may be very similar to those assumed by the “*Big Bang*” hypothesis, without invoking “*Creation ex nihilo*,” but according to the known principles of physics.

[G] The complex cosmic processes of the “*mutual annihilation*” between the “*ordinary world*” and its corresponding “*anti-world*” proceed from subatomic to super-cluster galactic levels. They may take a long cosmic period over many billion years; the radiative energy will spread out and generate “*fermions*” and “*anti-fermions*” via the physical mechanism of “*pair-production*.” Eventually, a segregated ensemble of fermions will form a new generation of “*ordinary world*,” and a separate ensemble of “*anti-fermions*” will produce a new generation of “*anti-world*.” During the generation of *new ordinary world* and *new anti-world* (which may take a long cosmic period), the Universe will appear to expand. Such periodic changes between the “*phase of annihilation*” and the “*phase of pair-production*” would keep on forever throughout the grand drama of the mysterious Universe, in accord with the known laws of physics.

Song 9: *On the Nature of Time.*

Scientists try to measure the physical flow of “*time*” as accurately as possible rather than making a futile definition of “*time*” verbally since the dawn of human civilization. They have established various “*calendars*” as the “*common reference of the regular flow of time,*” and tried to improve the accuracy throughout the history.

The most accurate device thus far invented is called the “*atomic clock.*” It measures the specific “*electromagnetic signals,*” which the moving *electrons* emit within a particular atom when they change their “*quantum state*” from one energy level to another level within the same atomic structure.

Song 10: *Measuring the Time Past.*

All materials are formed by various combinations of basic units of matter, called “*chemical elements.*” Each *element* is composed of its specific number of “*protons*” in its atomic nucleus, called its unique “*atomic number.*”

The same “*element*” can exist in many different “*isotopic forms*”: Various *isotopes* of the same element have different numbers of “*neutrons*” in the atomic nucleus.

Some isotopes of a specific *element* undergo spontaneous changes into different isotopes of the same element or "*transmutation*" to become a different *element* via various *nuclear physical processes*, called "*radioactive decay*."

Although the moment in time at which a particular atomic nucleus decays cannot be predicted, a collection of a large number of radioactive nuclei undergoes a statistically regular isotopic decay in the "*exponential time-course*," called "*age equation*" with its specific parameter, the "*half-life*." After the period of one *half-life* has elapsed, one-half of the atomic nuclei of the parental isotopic form would have decayed into its descendent isotopic form, called the "*decay product*."

The unstable isotope "*carbon-14*" undergoes "*radioactive beta decay*" to become a different stable element "*nitrogen-14*" with a *half-life* of 5,730 years. "*Carbon-14*" has been used as a dating method for the ages of carbonaceous materials up to 60,000 years old.

For measurements of absolute ages of rocks and fossilized organisms, "*two clocks of radioactive decays methods*" are used: "*Uranium-235 into Lead-207*" with a half-life of 704 million years and "*Uranium-238 into Lead-206*" with a half-life of 4.5 billion years.

The longest half-life of a radioactive isotope is about 7 million billion years of “*Samarium-148*,” which undergoes via “*alpha radioactive decay*” to become “*Neodymium-144*.” It is a half-million times longer than the entire age of the Universe, claimed by the *Big Bang* model (13.7 billion years old).

Song 11: *Mother Earth: The Planet of Life.*

The “*geological time scale*” provides a basic frame of time for the natural history of our Mother Earth: The “*Hadean Eon*,” the “*Archean Eon*,” the “*Proterozoic Eon*,” and the “*Phanerozoic Eon*” in descending temporal sequence from Earth’s formation about 4.5 billion years ago to the present point in the time’s flow. Each “*eon*” is subdivided into its various “*eras*”; *era* into “*periods*”; period into “*epochs*,”; and *epoch* into its various “*ages*.”

The “*Hadean Eon*” represents the time-interval between the Earth’s formation in the Solar system at about 4.5 billion years ago and the time-point 4 billion years ago.

The “*Archean Eon*” represents the time-interval between the emergence of the primordial “*prokaryotic life*” or earlier “*proto-life forms*” at about 4 billion years ago and the later time-point of about 2.5 billion years ago.

The “*Proterozoic Eon*” spanned between 2.5 billion and 541 million years ago.

The youngest current “*Phanerozoic Eon*” represents between 541 million years ago and the present time.

Song 12: *What is Life?*

“*Life*” may be regarded as the processes of changing interactions between an *organism* and its physical and social “*environments*.” Such processes of living interactions are sustained only for the timespan during which the organism is active in its living state. When the organism disintegrates at death, it ceases its living process irrevocably. An organism, however, may assume an “*inactive dormant state*” for a certain period during which it does not carry out active living interactions (for example, frozen at extremely low temperature). Still, it may resume its active life processes later. For example, “*frozen in vitro human embryos*” have been proved to develop to normal healthy children when they are thawed and implanted to the nourishing woman’s uterus after their prolonged inactive, dormant state in “*cryo-facilities*” for many years.

Hence, it is the conditions of the environment that determine the allowed state which an organism may assume: Either “*actively living state*,” “*inactive, dormant state*,” or “*disintegrated dead state*.”

Song 13: *Are other Intelligent Civilizations in the Universe?*

Dante asks about the possibility of the existence of other civilizations in the Universe. The dreamer says that recently scientists discovered many “*exoplanets*” which may have physical conditions similar to the planet Earth. But he confesses that the question of other “*cosmic intelligent civilizations*” in the Universe is far beyond his wit and lot. Hence, he should refrain from guessing any more on the profound mystery of the Universe.

He wishes to converse with Dante about meaningful questions on human nature, explored in *The Iliad* and *The Odyssey* by Homer.

Song 14: *Hymn to the Sacred Conscience of Human.*

The dreamer confides to Dante the gist of his fictional narrative poems. They are about the human characters of *The Iliad* and *The Odyssey* of Homer, such as “*Odysseus*,” “*Penelope*,” “*Nestor*,” “*Helen*,” “*Helenus*,” “*Andromache*,” and some other fictional human characters invented to play crucial roles in the human drama.

The above fictional poems attempt to look into the plausible human causes of the Trojan War, disregarding the fabulous mythical fables in *The Cypria* or other fables in the lost “*Epic Cycles*,” which attributed the Trojan War to divine characters

such as “*Hera*”, “*Athena*,” “*Aphrodite*”, “*Zeus*”, and “*Poseidon*.”

To pursue such an adventure, it was necessary to invent some crucial episodes which are substantially different from the classical texts of *The Iliad*, *The Odyssey*, and *The Epic Cycles*. The dreamer confesses that this fictional work is merely daydream in his earnest efforts to find some reasonable answers to the soul-searching deep questions on human nature, inspired by *The Iliad* and *The Odyssey* of Homer.

He sincerely hopes, however, that his naïve imaginations may make sense to conscientious readers of the inspiring poetry of Homer in the future generations of the strange species: *Homo sapience*, which happened to evolve over four billion years on this fleeting planet Earth in the vast Universe, to look into its own profound mystery with scared conscience and inquisitive, logical mind by use of their particular mental tool: *language*.

Song 15: *Dante’s Advice to the Dreamer at Farewell.*

Dante is genuinely concerned that the dreamer’s radical and bold ideas would cause him to suffer formidable animosities of the overwhelming majority of peoples who uphold their traditional faiths and opinions; they may prosecute him for blasphemy and destroy all his works. The dreamer confesses that

his only and utmost concern is how to complete his work honestly ere he perishes; he cannot afford to worry what other people would think about him or his work yet to be born. He entreats Dante to pray to God to bless the heathen dreamer in completing his poem: *Hymn to the Sacred Conscience of Human*. Dante encourages him that it will come forth into the light for the inner awakening of humanity, bidding his heartfelt farewell: '*Sing what your conscience feels deep in you with lucid reason, earnest devotion, and creative imaginations!* "Dante-pilgrim" will walk with you through your inner journey; "Dante-poet" will sing with you in your poem.'

Song 1

***Movements of the Earth
in the Solar System***

Song 1: *Movements of the Earth in the Solar System*

‘What is the Universe? How
does it work in such perfect harmony?’
asks Dante. ‘They are too profound questions 3
to discuss now; let me start
first where in the Universe we are,’
says the dreamer. ‘Go ahead.’ ‘We are on Earth 6
which is a small planet
in the “*Solar System.*”’ ‘I know it,’
says Dante. ‘Do you know that Earth is neither 9
at the very center of
the Universe, nor immobile
as it had been assumed to be at rest, 12
since the dawn of human
civilizations?’ *asks the dreamer.*
‘What? Do you mean that this Earth is moving?’ 15

Song 1: *Movements of the Earth in the Solar System*

‘Yes, Dante. Our Earth has
been regularly spinning once each day,
and it also revolves around the Sun once each 18
year. Hence, we are moving
with our Earth in the space at a very
fast speed, even if we think that we sit 21
still here.’ ‘It sounds to me
wrong and absurd: I see our Sun
rising in the east, sailing across the sky, 24
and setting in the west
each day, and countless shining stars
revolve around me in the night sky, when I 27
gaze at them standing still
rapt in deep wonder,’ *says Dante.*
‘It is due to the fact that the motion 30

Song 1: *Movements of the Earth in the Solar System*

of any object appears
to be relative: it depends on
the “*frame of space and time*,” taken as one’s 33
“*reference*” by each
observer of the motion. Because
we have always been moving with our Earth, 36
we assume that it is
a still “*motionless frame of*
reference.” But if one watches our Earth from 39
afar the “*outer space*”
as the Dante-pilgrim did with
his beloved Beatrice in their fabulous 42
astral journey as Dante-
poet imagined in *Paradiso*,
the observers realize that our Earth is 45

Song 1: *Movements of the Earth in the Solar System*

a sphere which spins around
its tilted north-south axis once each day,
while it revolves around the vast massive Sun 48
once every year along
its “*elliptical orbit,*” says
the dreamer. ‘Then, how does the Moon move?’ 51
‘The Moon orbits around our Earth
once every month and also around the sun
every year. It also spins itself once a month.’ 54
‘Tell me about the movements
of other celestial bodies,’ says
Dante. ‘The massive Sun keeps its planetary 57
objects to revolve around it
in their own “*particular orbits.*”
Our *Solar System* has eight major planets: 60

Song 1: *Movements of the Earth in the Solar System*

The four inner planets,
Mercury, Venus, Earth, and Mars are
mainly made of solid rocks and metals. 63

The two outer giant planets,
Jupiter and Saturn, are made of gases;
The two outermost planets, Uranus and 66
Neptune are made of ice.

All eight planets revolve the Sun
in their particular *elliptic orbits* 69
which lie in a thin disc,
called the “*ecliptic*.” There are many
other smaller objects which also revolve 72
the Sun: The “*Asteroid Belt*,”
which lies between the orbits of Mars
and Jupiter, has many “*asteroids*” made of small 75

Song 1: *Movements of the Earth in the Solar System*

rocks and metals. Beyond
the outermost orbit of Neptune,
there are many smaller icy objects, called “*trans-* 78
Neptunian objects and
comets” which also revolve our Sun
in highly “*eccentric elliptical orbits*” 81
with a wide range of “*orbital*
periods.” The major planets, except
Mercury and Venus have their own “*satellites*” 84
or *moons*, which revolve around
each planet in their specific
orbits with their particular “*orbital periods.*” 87
All these celestial objects
are also spinning about their own axes
with their specific “*spin-periods,*” says 90

Song 1: *Movements of the Earth in the Solar System*

the dreamer. ‘But what you say
sounds so strange to me as I cannot
feel such fantastic motions of our Earth 93
here and now, at all.
Who did claim such an odd idea
to be true?’ *asks Dante in disbelief.* 96
‘The revolutionary theory
of “*heliocentrism*,” in contrast to
the traditional “*geocentric dogma*,” 99
was advanced by “*Nicolaus*
Copernicus” and mathematically
formulated in his last book, “*On the Revolutions* 102
of the Heavenly Spheres”,
which was published in the year
of his death in 1543. This crucial book, 105

Song 1: *Movements of the Earth in the Solar System*

which marked the beginning of modern scientific thinking, was banned later by the Vatican as a heretic book.	108
The gruesome oppressions of the Vatican's bigotry cumulated in burning " <i>Gordano Bruno</i> " in 1600, because he supported the condemned " <i>Copernican theory.</i> " Even " <i>Galileo Galilei,</i> "	111 114
the renowned Florentine scientist, revered as the father of the modern science, suffered a trial by the " <i>Inquisition</i> " in 1633, and was compelled to abjure, curse, and detest	117 120

Song 1: *Movements of the Earth in the Solar System*

the *Copernican theory*.

He was condemned to house arrest
till his death in 1642. Despite the ban, 123

he completed his immortal
book, entitled “*Discourses and
Mathematical Demonstrations Relating* 126

Two New Sciences”, which
provided the foundation of the new
modern science, published in 1638 in Holland,’ 129
says the dreamer in dismay.

‘It is a shameful history that
the Vatican committed such horrible crimes 132
to the devoted honest

seekers of the scientific truth,’
sighs Dante in sincere indignation, 135

Song 1: *Movements of the Earth in the Solar System*

‘The freedom of thinking
is absolutely essential for any
creative work!’ ‘I remember vividly, 138
Dante, how bravely you
indicted certain popes for abuse
of their worldly power and corruption; 141
You condemned them to
suffer forever in your *Inferno*.
I am so glad that your bold, earnest poem 144
was not banned by the Vatican,’
says the dreamer in relief. ‘I thank
God for His protection.’ ‘Another great 147
scientist who was deeply
influenced by Copernicus was
“*Johannes Kepler.*” He formulated his three laws 150

Song 1: *Movements of the Earth in the Solar System*

of planetary motions,
based on concrete observations,
in his book, entitled “*Epitome of Copernican* 153
 Astronomy”, published in 1621.
Kepler’s “*Epitome*” and Galileo’s
“*Discourses*” influenced “*Isaac Newton*” to 156
 formulate the “*laws of*
 motion and the universal gravitation”
in his monumental book, “*Mathematical* 159
 Principles of Natural
 Philosophy”, published in 1687.
Newton’s “*Principia*” has brought forth modern 162
 scientific investigations
of the nature of things and
their motions, and rational scientific 165

Song 1: *Movements of the Earth in the Solar System*

prediction of events
in the Universe, in accord with
the inherent fundamental principles 168
of nature,' *says the dreamer.*
'Do you claim that scientists have found
such ultimate principles of nature, 171
which supersede the divine
omniscience and omnipotence?'
asks Dante. 'No, I do not feign such absurd 174
and inane claims, at all.
I think that it is impossible
for the human brains to know the ultimate 177
principles of nature or
the absolute truth of the reality.
All our knowledge is merely provisional; 180

Song 1: *Movements of the Earth in the Solar System*

It evolves through ceaseless
tests and changes to reach a temporary
consensus among certain groups of mortal 183
human beings, living at
a particular era on this Earth.
Furthermore, our selection of particular 186
set of the fundamental
“*principles of nature*” may be
peculiar to the customs of the human 189
societies in our history.
If there exist other kinds of
“*Intelligent Beings*” in other regions 192
of the Universe, their ways
of thinking may be very different
from that of the humans, and they may have 195

Song 1: *Movements of the Earth in the Solar System*

established their own systems
of various “*principles of nature,*”
I imagine,’ *confesses the dreamer what he* 198
believes in. ‘I like how
you imagine, even if they may be
merely your fanciful daydreams,’ *says Dante.* 201

Song 2

*Newton's Laws of Motion,
Theory of Universal Gravitation,
and Rules of Reasoning*

Song 2: *Newton's Laws of Motion and Universal Gravitation*

‘I wish to learn what is
the very cause which enables
the celestial bodies move in such exquisite 3
 heavenly harmony.
Please expound the abstruse theories
of the bold, scientific geniuses for me 6
 in plain words as much as
it is feasible without mathematics
as I am utterly ignorant of the field,’ 9
 says Dante honestly.
‘I think that “*Newton's laws of motion*”
and his “*theory of universal gravitation*” 12
 are the most relevant
to your question. Hence, I quote
what Newton stated in his “*Principia*”: 15

Song 2: Newton's Laws of Motion and Universal Gravitation

“Law I: *Every body persists
in its state of being at rest
or moving uniformly straight forward,* 18
*except insofar as it is
compelled to change its state by force
impressed.* **Law II:** *The alteration of motion* 21
*is ever proportional
to the motive force impressed; and is
made in the direction of the right line* 24
in which that force is impressed.

Law III: *To every action there is
always opposed an equal reaction:* 27
*Or the mutual actions
of two bodies upon each other
are always equal and directed to* 30

Song 2: Newton's Laws of Motion and Universal Gravitation

contrary parts.” These three laws
of motion formulate the basic
principles of “*force*” and “*changes in motion.*” 33

‘Are they sufficient to
explain how the celestial objects
revolve on their specific orbits around 36

the Sun in their own orbital
periods?’ *asks Dante.* ‘No. Newton
formulated the crucial “*law of universal 39*

gravitation.” It was
derived by inductive reasoning
from empirical data of astronomical 42

observations and many
physical experiments on Earth.
The “*Newton's law of gravitation*” states 45

Song 2: *Newton's Laws of Motion and Universal Gravitation*

that every “*particle*”
attracts every other particle
in the Universe with a “*force*” which is 48
directly proportional
to the product of their “*masses*” and
inversely proportional to the square of 51
the distance between
their “*mass-centers*. ” If this mutually
“*attractive gravitational force*” is applied 54
to the second law of
motion, one obtains the explicit
mathematical equation which describes motion 57
of any objects, if they
are regarded as idealized “*point-*
masses, ”” *says the dreamer*. ‘What do you mean by 60

Song 2: Newton's Laws of Motion and Universal Gravitation

“*point mass*”?’ ‘If we assume
that the “*entire mass*” of an object
is concentrated at a point without spatial 63
extension, the object
is idealized as a “*point-particle*”
with a certain value of “*mass of non-zero,*” 66
says the dreamer. ‘If so,
it sounds to me a fabulous magic
rather than a rational science, as you 69
try to convince me that
this huge Earth must turn into
an absurd “*point-mass*” to explain how it 72
orbits around the Sun,’ *says*
Dante with a sincere criticism.
‘I appreciate your keen insight, Dante. 75

Song 2: *Newton's Laws of Motion and Universal Gravitation*

A scientific theory is
merely an approximate description
of the observed phenomena and their
prediction as accurately
as possible only provisionally,
until a discovery of new phenomena
compels us to revise
the old theory to include them
into the scope of the newly revised theory.

The “*classical theory of
Newtonian mechanics*” has described
and predicted remarkably well almost all
“*macroscopic phenomena*”
observed in the sky and on Earth
in the era, Newton worked,’ *says the dreamer.*

78
81
84
87
90

Song 2: *Newton's Laws of Motion and Universal Gravitation*

‘If so, it must have been
very useful in the practical sense.
But I have further questions on the nature 93
of the “*gravitational force*:”
How can a physical object exert
continuously a force onto another object 96
which is separated by
the empty space at an immense
distance, as if it were invoked by magic?’ 99
asks Dante. ‘Newton was
keenly aware of such criticisms
about his *theory of gravity*. After many 102
years of sincere efforts
to solve the problem, however,
Newton admitted in the last edition 105

Song 2: Newton's Laws of Motion and Universal Gravitation

of his "*Principia*" in 1726:
"I have not yet been able to
discover the cause of these properties 108
of gravity from phenomena,
and I feign no hypotheses... It is
enough that gravity does really exist 111
and acts according to
the laws I have explained, and that
it abundantly serves to account for all 114
the motions of celestial
bodies." says the dreamer.
'I appreciate Newton's sincere and lofty 117
integrity," says Dante.
'To prevent our misunderstanding
of any scientific theory, Newton professed 120

Song 2: Newton's Laws of Motion and Universal Gravitation

the following “*Rules of Reasoning in Philosophy*” in the later editions of his “*Principia*:” 123

“*Rule 1: We are to admit no more causes of natural things than such as both true and sufficient to explain their appearances.*” 126

Rule 2: Therefore, to the same natural effects we must, as far as possible, assign the same cause. 129

Rule 3: The qualities of bodies, which admit neither intensification nor remission of degrees, and which are found to belong to all bodies within reach of our experiments, are to be esteemed the universal qualities of all bodies whatsoever. 135

Song 2: Newton's Laws of Motion and Universal Gravitation

*Rule 4: In experimental philosophy we are to
look upon propositions inferred by general
induction from phenomena as accurately 138
or very nearly true, notwithstanding any
contrary hypothesis that may be imagined,
till such time as other phenomena occur, 141
by which they may either be made more
accurate, or liable to exceptions.”*

What do you think, Dante, of the above “*Rules
of Reasoning*” professed 144
by Newton?’ *asks the dreamer.*

‘I can grasp the Newton’s “*Rules of Reasoning*” 147
better than his abstruse
works of scientific genius,’ *exclaims*
Dante, with heartfelt respect and enthusiasm. 150

Song 2: Newton's Laws of Motion and Universal Gravitation

‘I admire your insightful
keen perception, my revered poet!
The Newton's “*Rules of Reasoning*” have been 153
the vital principles
which guide us on how to carry out
our scientific investigations in concrete 156
experimental researches
by explicit mathematical
inductions from the actually observed 159
phenomena rather than
polemic arguments on our imagined
fanciful ideas,’ *says the dreamer in elation.* 162
‘They remind me of what
you mentioned about the Xenophanes’s
profound, insightful philosophical poems.’ 165

Song 2: Newton's Laws of Motion and Universal Gravitation

‘Please explain to me what
you mean, Dante.’ ‘You told me that
Xenophanes had expounded the intrinsic 168
limit of the human’s
capability in knowing the true
ultimate reality in itself as he asserted: 171
*“...and, of course, the clear and
certain truth no man has seen nor
will there be any human who knows about 174
GOD/ONE and what I say
about such things. For even if, in
the best case, one happens to speak just 177
of what has been brought to pass,
still he himself would not know
the ultimate truth. ...But honest opinion 180*

Song 2: Newton's Laws of Motion and Universal Gravitation

is allotted to humans.

These things seem to me to resemble
close to the reality. As GOD/ONE does not 183
reveal things clearly to
mortals, men should find them out
better by searching in the course of time." 186

Do you remember now
what you told me about Xenophanes?'
'Yes, Dante. Xenophanes was the pioneer, 189
who recognized honestly
the intrinsic limit of what
the human brains could learn about the ultimate 192
reality: The Newton's
"Rule 4 of Reasoning" is
an explicit and eloquent formulation 195

Song 2: Newton's Laws of Motion and Universal Gravitation

of this fundamental fact,
I think,' says *the dreamer with firm*
conviction. 'Do you believe that the laws 198
of nature are not permanent
but undergo changes?' asks *Dante*.
'No. What I try to mean is that the opinions 201
formulated as "*theories*"
or "*hypotheses*" by the human brains
with regards to the intrinsically unknowable 204
"*true laws of nature*" do
undergo gradual changes from
preceding theories to new theories as 207
the human's experiential
researches on nature progress in time.
For example, discoveries of new phenomena 210

Song 2: Newton's Laws of Motion and Universal Gravitation

which could not be explained
by the Newtonian mechanics prompted
the formulation of a new theory of gravity, 213
called "*Theory of General*
Relativity" by "*Albert Einstein*"
in 1915. This new theory postulates 216
that "*energy*" and "*momentum*"
of a "*point-particle*" distort
the "*space-time curvature*" in its vicinity 219
such that other "*particles*"
move in "*trajectories*," determined
by the "*geometry of space-time*." According 222
to the Einsteinian theory,
the Newtonian gravitational force
is regarded as an unreal "*fictitious force*" 225

Song 2: Newton's Laws of Motion and Universal Gravitation

due to the “*curvature*
of *space-time*.” The “*gravitational*
acceleration” of an object in “*free fall*” 228
is due to its “*world-line*”
being a “*geodesic of spacetime*,”
says the dreamer. ‘As Newton said, I feign 231
no opinion because
I do not understand at all
the abstruse “*geometry of space-time*.” 234
But how is it possible
for a “*physical matter*” to
exert actually concrete effects to distort 237
the abstract “*frame of*
space-time coordinate of reference,”
chosen by the brain of a human observer?’ 240

Song 2: *Newton's Laws of Motion and Universal Gravitation*

asks Dante. 'I feign no
answer to your keen insightful
question, Dante. I confess that all our 243
theories may be merely
provisional magic opinions,
invented by the imaginative human brains,' 246
says the dreamer.

Song 3

On the Nature of Stars in the Sky

Song 3: *The Nature of Stars in the Sky*

‘I would like to hear more
about the moving stars in the sky
rather than the abstruse theories in the brains 3
of the scientific geniuses.
What does enable the countless
stars to shine their lights so mysteriously?’ 6
asks Dante. ‘A star is
a luminous, massive object
in the state of “*plasma*,” caused and sustained 9
by the “*gravity*” of
its own huge “*mass*,”” *says the dreamer.*
‘What is plasma?’ ‘It is the “*electrically* 12
ionized state” which a matter
assumes under extremely high
“*temperature*” and “*pressure*,” instead of “*gas*,” 15

Song 3: *The Nature of Stars in the Sky*

“liquid,” or “solid” states
under milder conditions,’ says
the dreamer. ‘If so, a dark object could be 18
ignited to beam a light
by the gravity of its own mass?’
‘Yes, Dante! When its total mass exceeds 21
a critical value of
about one-eighth of the “*mass of our Sun*,”
a huge “*gaseous nebula*,” composed mostly 24
of “*hydrogen*” (the simplest
element), begins to condense due to
its own gravity. Gradually it becomes 27
a dense spheroidal object,
called “*proto-star*.” When its central
core reaches the critical high temperature 30

Song 3: *The Nature of Stars in the Sky*

and pressure, hydrogens
begin to “*transmute*” into another
element, called “*helium*” in the “*subatomic* 33
 process”, known as “*thermo-*
 nuclear fusion” at its core. This
produces a vast amount of energy which is 36
 transferred to all other
parts of the star. This process of
“*energy-generating nuclear fusion,*” called 39
 the “*main sequence*” is enhanced
by itself to keep on, once it is
initiated by the gravity as long as 42
 reservoir of fuels in
the star lasts,’ *says the dreamer.*
‘It is marvellous and fascinating to learn 45

Song 3: *The Nature of Stars in the Sky*

that our Sun had been a dark
object before it was ignited
by its own gravity to shine!’ *exclaims Dante.* 48

‘Yes. Our Sun developed
from dark gaseous interstellar
“*molecular clouds*” which consisted mostly of 51
hydrogen, about four and
a half billion years ago.’ ‘I see.

What is the fate of our Sun in the future?’ 54

‘The initial mass of each star
is the crucial factor which determines
the course of its “*stellar evolution*” and 57

“*eventual fate.*” The stars
are classified according to
the range of their “*initial total masses.*” 60

Song 3: *The Nature of Stars in the Sky*

For a very low mass star,
called “*red dwarf*” which has a mass less
than a half of the Sun’s mass, the “*nuclear fusion*” 63
occurs very slowly. Its
lifetime in the *main sequence* may
last for many trillion years. Then it will enter 66
to its final stage as
a “*white dwarf*” star, eventually.
Our Sun belongs to the class of low mass 69
stars which have their masses
between a half and two and a half
times of the Sun’s mass. In this class of stars, 72
nuclear fusion occurs
faster than that of the *red dwarf* stars.
Their lifetime in the main sequence is about 75

Song 3: *The Nature of Stars in the Sky*

ten billion years. When
the “*hydrogen reservoir*” is depleted,
the core contracts further by its gravity. 78

The rise of its temperature
causes the outer layers of the star
to expand and cool. The expanded star enters 81
to its new stage of life
as a “*red giant*.” It begins to burn
“*helium*” into “*carbon*.” The star accumulates 84
“*degenerated Carbon-*
Oxygen” in its core, and eventually
burst out its outer shells as “*planetary* 87
nebula”, and its dense core
becomes a much smaller star, called
a “*white dwarf*.” Our Sun will follow such 90

Song 3: *The Nature of Stars in the Sky*

a course of its “*stellar*
evolution”: It will continue
about five and a half billion years more in 93
converting “*hydrogen*”
into “*helium*.” When our Sun depletes its
core hydrogen, it will start the “*red-giant-branch*” 96
phase of its life, during
which it will expand to engulf
Mercury, Venus, and Earth, but its mass 99
will decrease. *Helium* in its
core will be rapidly converted
into “*carbon*.” Eventually a half of our Sun’s 102
mass will be ejected
to be a “*planetary nebula*,”
from which new planets will evolve someday. 105

Song 3: *The Nature of Stars in the Sky*

Its core will remain as
a dense, compact “*white dwarf*” star.
In the case of a massive star whose mass exceeds 108
ten times of our Sun’s mass,
it will undergo much more rapid
and dramatic changes in its evolution. 111
Nuclear fusions accelerate
in its larger and denser core
very rapidly. Its life-stage in the “*main* 114
sequence” may be as short
as just for a few million years.
When it depletes *hydrogen*, it begins 117
to burn *helium*. At this
new phase, its size expands to become
a “*super-giant star*.” When helium is exhausted 120

Song 3: *The Nature of Stars in the Sky*

at its core, the massive star
begins to burn *carbon*. Such “*thermo-*
nuclear fusions” proceed in the successive stages, 123
fueled by “*neon*”, “*oxygen*”, and
“*silicon*.” Eventually, the massive star
produces “*iron*.” Any “*fusion beyond iron*” 126
consumes rather than produces
energy. Eventually, its dense iron core
suddenly collapses and its own powerful 129
“*shockwaves*” cause the star
to explode in an extremely
brilliant “*supernova*.” The explosion 132
blows away its outer layers,
which shine for many years as the remnant
of the *supernova*. They contain various “*heavy* 135

Song 3: *The Nature of Stars in the Sky*

elements” such as iron, lead,
silver and gold as well as light
elements such as carbon, nitrogen, 138
and oxygen. These elements
are reused during the formation
of new stars and their planets: In fact, 141
we are made of the “*star-ashes,*”
left by the “*supernova explosions*”
in the cosmic drama of the Universe,’ 144
says the elated dreamer.
‘I see. It takes my breath away
to realize that we have inherited our body 147
as well as our spirit
from the stars,’ *whispers Dante*
to himself rapt in a deep meditation. 150

Song 3: *The Nature of Stars in the Sky*

‘After its explosions
in a supernova,’ says *the dreamer*,
‘the cores of massive stars are compressed 153
into either extremely
dense “*neutron stars*,” or even into
mysterious physical objects, called “*black holes*” 156
in the case of very massive
supergiant stars.’ ‘What is a black hole?’
‘It is a mysterious “*region of space-time*” 159
which manifests such strong
gravitational effects that nothing
can escape from its inside. The boundary 162
of a “*black hole*” from which
neither matter nor light can escape
is called the “*event horizon of the black hole*.” 165

Song 3: *The Nature of Stars in the Sky*

Although it is impossible
for us to see a black hole, because
even light cannot escape from its strong 168
gravitational grip,
the presence of a black hole may be
inferred from its interactions with other 171
matters and lights outside
its *event horizon*. External
matters that are attracted to orbit around 174
its event horizon
form an “*accretion disk*” which
emit strong “*electromagnetic waves*.” If other 177
stars orbit a “*black hole*,”
observation of their orbits
can be used to estimate the mass and 180

Song 3: *The Nature of Stars in the Sky*

location of the unseen
black hole. In such indirect methods,
scientists infer that there exists a “*super-* 183
massive black hole” whose total
mass is estimated to be four million
times greater than the Sun’s mass, located 186
at the central core of
our “*Milky Way Galaxy*. ” In fact,
our “*solar system*” revolves around the massive 189
central core of the *Milky Way*
Galaxy, once in two-hundred-forty
million years,’ *says the dreamer*. ‘If so, there 192
must have existed a super-
giant star which had an enormous
mass greater than four million times that of 195

Song 3: *The Nature of Stars in the Sky*

our Sun, before it exploded	
to become the unseen massive	
black hole which makes our Sun to revolve	198
around it. The cosmic drama	
of the stars, as revealed by the frail	
human brains fleeting on this tiny planet	201
Earth, is too immense, abstruse	
and mysterious beyond my ken	
and wit,' <i>whispers Dante to himself,</i>	204
<i>elated in awe and wonder.</i>	

Song 4

On the Nature of Matter and Energy

Song 4: *The Nature of Matter and Energy*

‘Every physical thing,
I presume, is made of matter.
But I do not know what “*matter*” really is. 3
Tell me what you know
about it,’ says *Dante earnestly*.
‘It is so basic yet the most abstruse concept. 6
The “*ordinary matter*” is
composed of “*atoms*, ” which combine
with other *atoms* to form “*molecules*. ” 9
Our body is an evident
example of a physical substance
which occupies a specific volume of space 12
at a given time and
possesses a quantitative property
of matter, called its “*mass*, ” and another 15

Song 4: *The Nature of Matter and Energy*

quantitative property,
either positive or negative
“*electric charge.*” An *atom* can be split into 18
its subatomic component
particles, called “*protons*” which has
“*positive electric charge,*” neutral “*neutrons,*” 21
and negatively charged “*electrons.*”
The massive “*atomic nucleus*” consists
of “*protons*” and “*neutrons*” at the center 24
of the “*atomic structure.*”
The “*electrons*” revolve around the “*nucleus,*”
analogous to how planets orbit around the Sun,’ 27
says the dreamer. ‘How wondrous
it is that the atoms which build-up
our bodies have the same form as the Solar 30

Song 4: *The Nature of Matter and Energy*

System. Is it the same
gravity that makes the electrons
to orbit around the atomic nucleus?’ 33

‘The “*positively charged nucleus*”
and the “*negatively charged electrons*”
are attracting via “*electrostatic force*” 36

which is enormously stronger
than the “*gravity*” in the “*atomic structure.*”

A “*hydrogen atom*” consists of one *proton* 39
and one *electron*. A “*helium*
atom” has two *protons* and two *neutrons*
in its *nucleus* and two “*orbiting electrons.*” 42

When two *hydrogen atoms*
bind to share their orbiting *electrons*,
they form a stable “*hydrogen molecule.*” 45

Song 4: *The Nature of Matter and Energy*

Most physical phenomena
on our Earth are governed by either
attractive or repulsive “*electromagnetic* 48
forces” between opposite
or same polarity, respectively,
of the “*electric charges*” of *ordinary matter*. 51

All biological processes
are manifestations of complex
“*electromagnetic interactions*” among 54
numerous components
of matter,’ *says the dreamer with*
resolute confidence. ‘I see. Do you claim 57
that there is no fundamental
difference between a living thing
and a dead matter?’ *asks Dante*. ‘*Atoms* and 60

Song 4: *The Nature of Matter and Energy*

stars are as alive, I think,
as any “*living things*”: Our Sun has
been generating enormous vital energy 63
and shining lights in the form
of “*electromagnetic radiations*”
which have enabled the “*life*” to emerge on 66
Earth and sustained its journey
through the “*biological evolution*”
to make the self-conscious *Homo sapience*,’ 69
says the dreamer in awe.
‘What is an electromagnetic
radiation?’ ‘It is a “*wave of oscillating*” 72
electromagnetic field”,
formulated by “*James Clerk Maxwell*”
in 1865: The wave is emitted by “*electrically*” 75

Song 4: *The Nature of Matter and Energy*

charged moving particles”.

It carries “*electromagnetic radiant energy*” away from its source particle, and 78
imparts its *radiant energy*
to other *particles* when they interact.

They are characterized by their “*frequencies of oscillation*” or “*wavelengths.*” 81

Light is its narrow band, to which
our “*visual receptor cells*” can interact, 84
in the wide range of “*spectrum of electromagnetic radiations.*”

They propagate themselves at the fast speed 87
of light, without the continuing
influence of the “*moving electric charges*”
that produced them,’ says *the dreamer.* ‘I see. 90

Song 4: *The Nature of Matter and Energy*

I'm glad to learn what light is,'
says Dante. 'Light has "*dual nature*":
It may be regarded as "*photons*" which are 93
the discrete "*quanta*" of
the "*electromagnetic radiation*,"
responsible for "*physical interactions*" 96
with matter." A "*photon*" is
an "*uncharged elementary particle*"
which is emitted or absorbed, if an *electron* 99
jumps its orbit from one
"*quantized energy level*" to another
within the same *atom*. The energy of 102
a *photon* is equal to
frequency of its oscillation times
the "*Planck's constant*," in the "*quantum theory*," 105

Song 4: *The Nature of Matter and Energy*

formulated by “*Max Planck*”
in 1900. A “*photon*” propagates,
however, as if it were a wave with 108
the speed of light. The “*wave-*
like” and “*particle-like*” dual nature
is also found in “*electrons*” and other 111
“*elementary particles*”
which constitute the *atomic structure*
of the ordinary matter,’ *says the dreamer.* 114
‘Perhaps our naïve concept
of particle or wave is unfit
to look into the subtle, mysterious, 117
and fundamental entities
of nature,’ *whispers Dante to*
himself. ‘I concur with you. There exists 120

Song 4: *The Nature of Matter and Energy*

“*antiparticle*” which has
the “*opposite electric charge*” of its
corresponding particle of ordinary matter: 123

The “*antiparticle*” of
electron, called “*positron*” has
positive charge of the same quantity and mass. 126

“*Proton’s antiparticle,*”
called “*antiproton*” has a negative charge.
If any *particle* collides with its *antiparticle*, 129
both of them undergo

“*mutual annihilation,*” and *transmute*
as very powerful “*radiations of energy*” 132
such as “*gamma rays.*”

The “*energy*” released by the *annihilation*
is equal to the “*total mass*” of the collided 135

Song 4: *The Nature of Matter and Energy*

“matter” and “antimatter,”
multiplied by the square of light-speed,
in accordance with the “*mass-energy* 138
equivalence equation,”
formulated by “*Albert Einstein*” in 1905.’
‘It takes my breath away to learn such a strange 141
and transcendental episode
in the grand drama of our Universe,’
interrupts Dante in elation, ‘are there 144
stars which are made of such
antimatters?’ ‘We do not know it, yet.
Antimatters can be produced by “*particle* 147
accelerators” for only very
brief periods, but they annihilate
soon by interactions with ordinary matter 150

Song 4: *The Nature of Matter and Energy*

on Earth,' *says the dreamer.*

'Is it possible to create matter
from radiation as a reverse process 153
of the annihilation?'

asks Dante. 'Yes. If a high energy
photon is radiated to a massive nucleus 156
of an atom, a new pair

of "*positron*" and "*electron*" is emitted
from the atom. Hence, "*annihilation*" and 159
"*generation*" of matter

are reversible phenomena
during which "*energy*" and "*momentum*" must 162
be conserved to occur.'

'I see. The conservation
of energy is the predominant principle 165

Song 4: *The Nature of Matter and Energy*

regardless of whether
matter seems to us to appear
like a particle or an energetic wave 168
in different situations.’
‘Yes, Dante. There exist two kinds
of “*elementary entities*” of nature: “*substance*” 171
and “*force*” that interacts
with *substance*. Two or more identical
substances, called “*fermions*,” cannot occupy 174
the same “*quantum state*”
simultaneously, obeying to
the “*exclusion principle*,” formulated by 177
“*Wolfgang Pauli*” in 1925.
For example, two protons cannot
occupy the same position simultaneously. 180

Song 4: *The Nature of Matter and Energy*

In contrast, the physical
carriers of force, called “*gauge-bosons*”
are free from the exclusive restriction. 183

As a “*photon*” is a “*gauge-*
boson”, many *photons* can occupy
the same location simultaneously as 186

many “*waves*” can be “*super-*
imposed”. “*Photon*” is the “*carrier*
of the electromagnetic force”, which interact 189

with “*fermions*.” There are other
“*bosons*” which carry different forces:
The “*strong nuclear forces*” that bind “*elementary*” 192

fermions”, called “*quarks*” to form
protons and *neutrons* in the nucleus
of an atom, is a “*gauge-boson*” called “*gluon*.” 195

Song 4: *The Nature of Matter and Energy*

The “*weak nuclear forces*,” which
make the atomic nucleus to undergo
“*transmutations*” to become different 198
elements via “*radioactive*
decays” of atoms, are carried out by
massive “*gauge-bosons*,” called “*W+*,” and “*W-*.” 201

The ordinary *matter*
and its corresponding *antimatter*
are composed of “*fermions*” which obey 204
the “*Fermi-Dirac statistics*,”
formulated by “*Enrico Fermi*”
and “*Paul Dirac*.” The interactions of *fermions* 207
are mediated by
the “*force-carrying bosons*” which obey
the “*Bose-Einstein statistics*,” formulated by 210

Song 4: The Nature of Matter and Energy

“Satyendra Bose,” and
“Albert Einstein.” The “Standard Model”
of our current physics classifies “*fermions*” 213
into two families: “*hadrons*”
and “*leptons*.” *Hadrons* are *composite*
fermions, made of two or more “*quarks*,” bound 216
by “*the strong nuclear forces*,”
mediated by “*gluon*.” “*Leptons*” are
“*unitary fermions*,” which are not involved in 219
the “*strong nuclear force*”
but they are subjected to the “*weak nuclear*
force,” “*electromagnetism*,” and “*gravitation*.” 222
There are six types of *quarks*,
known as their “*flavours*,” grouped in three
“*generation*.” The “*first-generation quarks*” have 225

Song 4: *The Nature of Matter and Energy*

either “*up*” or “*down*” *flavours*;
the *second-generation quarks* have
“*charm*” or “*strange*” *flavours*; the *third generation* 228
quarks have “*top*” or “*bottom*”
flavours. For every “*quark flavour*”
there is its corresponding type of “*anti-* 231
particle,” called “*anti-quark.*”
Hadrons which consist of three *quarks*
such as *protons* and *neutrons*, are called 234
“*baryons.*” When a *quark* binds
with its *anti-quark* by *strong nuclear*
interaction, they form a two-quark “*meson,*” 237
which decays rapidly
into *electrons* and “*neutrinos.*”
Leptons are also classified into six 240

Song 4: *The Nature of Matter and Energy*

types of their “*flavours*,” grouped
in three generations: The *first-generation*
leptons, called “*electronic leptons*” are 243
the well-known charged “*electrons*”
and neutral “*electron-neutrinos*”;
the *second-generation leptons* are called “*muons*” 246
and neutral “*muon-neutrinos*”;
The third-generation leptons are called
“*tau*” and “*tau-neutrinos*.” For every *lepton* 249
flavour there is a corresponding
type of antiparticle, called “*antilepton*.”
These *elementary particles* had been predicted 252
by the theories, formulated
by “*Murray Gell-Mann*” and others.
The existence of various *elementary particles* 255

Song 4: *The Nature of Matter and Energy*

was recently detected
by concrete experiments with
powerful “*accelerators of particles.*” 258

This is a gist of
the fascinating story about how
humankind has adventured deep into 261
the hidden infinitesimal
realm of which we are made, and
muse on its mystery,’ *says the dreamer in awe.* 264

‘The story of our inner
universe is too abstruse and
mysterious for me to comprehend what it means. 267

It takes away my breath that
the mortal humans could look so deep
into the mystery of nature,’ *whispers Dante* 270
elated in deep wonder. 271

Song 5

*The Structure of the Observed
Part of the Universe*

Song 5: *Structure of the Observed Part of the Universe*

‘Where are we in the cosmic
drama of existence?’ *whispers*
Dante to himself. ‘We are fleeting through 3
the void aboard Earth within
the “*Solar System*,” which is a tiny
part of a vast realm: the “*Milky Way Galaxy*.” 6
It is composed of about three
hundred billion stars which shine lights,
many planets which orbit around their stars, and 9
other invisible objects,’
says the dreamer. ‘I see many stars
twinkling in the night sky, but they are too far 12
away for me to appreciate
the mystery of their immense realm.’
‘To describe such a vast dimension, we use 15

Song 5: *Structure of the Observed Part of the Universe*

a unit of very long length,
called “*light-year*”: the distance travelled
by light in the span of a year. One *light-year* 18
is about nine and a half
pentameters.’ ‘How long is a meter?’
‘My height is about one and a half meters. 21
Reflected sunlight from the Moon’s
surface takes about one second to
travel the distance to the Earth’s surface, 24
whereas it takes about five
hundred seconds for light to travel
the distance between the Sun and the Earth, 27
defined as *one “astronomical*
unit” (AU) of length,’ *says the dreamer.*
‘The Moon is so much closer to us than 30

Song 5: *Structure of the Observed Part of the Universe*

the Sun.’ ‘The Moon is the only
celestial object which humans
visited actually first in 1969.’ ‘What? 33
How could mortal humans
carry out such miraculous tasks?’
says Dante in astonishment and sheer thrills. 36
“‘Astronauts” flew in “spacecrafts,”
landed on the Moon, walked on its soil,
and brought its rocks back safe to our Earth.’ 39
‘It is brave and incredible
adventures of mankind into
the celestial realm,’ *exclaims Dante in awe.* 42
‘There are many “space probes,”
which explore in the vast outer space
beyond the Moon; they are smaller *spacecrafts* 45

Song 5: *Structure of the Observed Part of the Universe*

without human crews, but
remotely controlled by scientists
on the Earth. They *fly by, orbit, or land* 48
on other planetary objects,
such as Mars, Venus, Mercury,
Jupiter, and Saturn to collect and send 51
scientific information
for us to study here on Earth.
The most distant space probe, named “*Voyager I*”, 54
was about 20 “*light-hours*” away
from the Earth as of January 2019.
It was the first humanmade object which left 57
our *Solar System* and
explores the vast interstellar space.
There are many powerful “*space telescopes*” that 60

Song 5: Structure of the Observed Part of the Universe

orbit around the Earth with which
scientists on Earth can study the immense
structure and physical properties of the Universe.’ 63

‘They are astonishing
and fantastic feats, performed by
mortal human beings. Would someday the humans 66
may visit a star?’ *asks*

Dante. ‘I don’t think so. The nearest
star, named “*Proxima Centauri*” is about four 69
light-years away from us.

It is a small “*red dwarf star*” whose
mass is only one eighth that of our Sun. It has 72
a planet, named “*Proxima*

Centauri b,” which is the nearest
known “*extra-solar planet*.” To travel across 75

Song 5: Structure of the Observed Part of the Universe

the vast distance, it will take
longer than many hundred thousand years
for any *spacecraft* built by humans to reach it; 78
It is an epoch longer than
the entire period during which
the species, *Homo sapience sapience*, emerged 81
on the Earth, and began
to write down its history about five
thousand years ago. Our science and technology 84
are less than five hundred
years old.' 'I see your point,' says *Dante*.
'The brightest star in the night sky, named "*Sirius*," 87
is about eight light-years away.
It is twice as massive but twenty-five
times brighter than our Sun. Our *Solar System* 90

Song 5: Structure of the Observed Part of the Universe

is located on the inner
edge of the spiral of matters, called
the “*Orion-Cygnus Arm*, ” at twenty-seven thousand 93
light-years away from the center
of the *Milky Way Galaxy*: it is
a “*barred spiral galaxy*” which extends 96
between one hundred fifty
and two hundred thousand *light-years*.
The stars within its radius of ten-thousand 99
light-years from the galactic
center are tightly packed as “*bulge*”
from which “*bars*” protrude. The galactic center 102
emits an intense radio
waves near “*Sagittarius*. ” They are
attributed to a “*supermassive black hole*, ” 105

Song 5: *Structure of the Observed Part of the Universe*

estimated to be four million
times greater than the mass of the Sun.
Our Solar System revolves around the galactic 108
center with its orbital
period of about two hundred forty
million years. Scientists discovered that stars 111
at a wide range of distances
from the *Galactic Center* orbit around it
at a constant speed. Because this phenomenon 114
contradicts the laws of
motion and gravity, they postulate
that there must exist invisible “*dark matter*,” 117
which interact with matter
only gravitationally, neither
emitting nor absorbing electromagnetic 120

Song 5: Structure of the Observed Part of the Universe

radiation. According to
the “*Dark Matter Hypothesis*,” about
ninety percent of the *Milky Way Galaxy*’s mass 123
must be attributed to
the unseen “*dark matter*.” But we know
nothing about its real physical nature at all,’ 126
says the dreamer honestly.
‘The mystery of nature is truly
fathomless,’ *whispers Dante to himself.* 129
‘The over-all structure of
the Universe is immense and complex:
The *Milky Way* galaxy belongs to the “*Local Group*” 132
of about fifty galaxies,
surrounded by a vast “*Local Void*.”
Two smaller galaxies, named “*Large and Small*” 135

Song 5: Structure of the Observed Part of the Universe

Magellanic Clouds” and many
“*dwarf galaxies*” orbit around our *Milky Way*
in the *Local Group*. The “*Andromeda galaxy*,” 138
which is the largest one
in the *Local Group*, has about one
trillion stars: It is about two and a half 141
million *light-years* away from us.
Its center may contain a huge
“*super black hole*,” about one-hundred-fifty 144
million times the mass of
our Sun. The *Andromeda* and
our *Milky Way* galaxies will collide in about 147
four billion years: they will
merge to form a giant “*elliptical*
or *disc galaxy*.” Such mergers are common 150

Song 5: *Structure of the Observed Part of the Universe*

events in the evolution
of galaxies. A cosmic structure,
composed of many hundreds to thousands 153
galaxies that are bound
together by *gravity* is called
a “*Cluster of Galaxies.*” Aggregates of 156
less than a hundred galaxies
are called “*Galaxy Groups*” such as
our *Local Group*. Many *galaxy-groups* and 159
galaxy-clusters form
a more massive cosmic structure, called
a “*Supercluster*” of galaxies. We belong 162
to a local *supercluster*,
named “*Laniakea,*” which harbours
our *Milky Way* and a hundred thousand other 165

Song 5: *Structure of the Observed Part of the Universe*

nearby *galaxies*, gathered
to the extent of five hundred
million *light-years*. Its center of mass near 168
the “*Norma galaxy-cluster*”
is called the “*Great Attractor*” which
exerts gravitational attraction of its galaxies. 171
The observed part of
the Universe is estimated to contain
many millions of “*Superclusters*” of galaxies,’ 174
says the dreamer. ‘What is
the size of the whole Universe?’ *asks*
Dante. ‘Its answer is quite intricate: 177
Suppose that an astronomer
on Earth detects the light, emitted
by the most distant star in the observed 180

Song 5: Structure of the Observed Part of the Universe

Universe. The photons which
causes their perception by the brain
of the observer, right now, must have travelled 183
for a long expanse
of time since the star emitted them
at a time in the long past to reach us. 186
Let's assume that the distance
is ten-billion *light-years*. Then the light
was emitted from the star ten billion years 189
before it finally reaches
the observer's eyes on Earth, right now.
The emission of light by the star was 192
an ancient event that
occurred ten billion years ago, long
before any life evolved to look at it on Earth. 195

Song 5: Structure of the Observed Part of the Universe

Hence, what we observe about
distant objects, now, are merely
ancient relics of past events which occurred 198
at the remote places within
our Universe,’ says *the dreamer*. ‘Yes,
I see your point.’ ‘Scientists discovered 201
an astounding fact that
the “*frame of space*” of the Universe
is not permanent but changes with time. 204
“*Vesto Slipher*” found in 1912
that the wavelengths of light coming
from many “*spiral nebulae*” were longer; that is, 207
they showed “*redshift*,” when they
were compared with the standard “*spectra*
of hydrogen” or other elements, measured 210

Song 5: *Structure of the Observed Part of the Universe*

on Earth. The *redshift* suggested
that these objects were moving away
from Earth. “*Edwin Hubble*” found in 1924 213
that the vague objects, called
“*nebulae*” (which had been mistaken
as clouds of dusts and gases within the *Milky Way*) 216
were vast *galaxies* far away
from the *Milky Way Galaxy*. He found
an empirical law that “*recessional velocities*” 219
of other galaxies increased
proportional to their *distances* from Earth.
This finding suggests that the whole structure 222
of the *Universe* is changing
in a dynamic expansion rather than
stays in a static equilibrium state. Hence, 225

Song 5: *Structure of the Observed Part of the Universe*

the size of the whole Universe
is not constant but changes with time.
The most distant cosmic object so far observed 228
is the “*quasar*,” named “*ULAS*
J1342.” It is an extremely luminous
and active “*galactic nucleus*” which had 231
a “*supermassive blackhole*”
eight-hundred million times Sun’s mass
about thirteen billion years in the time past. 234
Its “*co-moving distance*”
from our Earth is about thirty billion
light-years away. If we assume that our Earth 237
is at the center of
the whole universe, then we may imagine
our universe to be an immense *sphere* with 240

Song 5: *Structure of the Observed Part of the Universe*

a radius of not less than
thirty billion light-years long.’
‘Thank you for your elaborate detours 243
to answer my naïve question,’
says Dante. ‘The revolutionary discovery
that the *Universe* changes with time has inspired 246
new scientific studies
of the origin and evolution
of the dynamic Universe,’ *says the dreamer.* 249

Song 6

***Current Hypotheses on
the Origin and Evolution
of the Universe***

Song 6: *On the Origin and Evolution of the Universe*

‘Your story about our Universe
is getting more dramatic as
it is unfolding. Tell me how its expansion 3
tells about the origin of
the Universe,’ says *Dante with sincere*
curiosity. “*Georges Lemaitre*” postulated 6
in 1927 that at a definite
point of time in the past, the Universe
happened to begin (or born) as a tiny 9
“*primeval atom,*” which has
expanded since its birth. His hypothesis
of the primeval atom is miscalled later 12
as the “*Big Bang Theory.*”
‘Was there a cosmic explosion
at the birth of our Universe?’ asks *Dante*. 15

Song 6: *On the Origin and Evolution of the Universe*

‘No! It is an expansion
of the “*frame of space-time of the Universe*,”
not explosion of matters through a static frame 18
of its space and time, as
in the case of an explosion of
materials and energy from a *supernova* 21
into space.’ ‘If so,
“*Big Bang*” sounds to me a foolish
and misleading name for such a crucial 24
event: the very birth of
our Universe,’ says *Dante*. ‘Yes, I
think so, too. “*Big Bang*” hypothesis requires 27
that concepts of “*space*” and “*time*”
must be revised: The Universe was not
born in a “*pre-existing space*” at a “*pre-existing* 30

Song 6: *On the Origin and Evolution of the Universe*

time-frame”, but the “*space*” began
to emerge and the “*time*” began
to flow through the Universe only after its “*birth!*”” 33

‘I see. It is a strange
and confusing change in our most
common and fundamental concepts,’ says *Dante*. 36

‘The best current theory, called
“*Lambda-CDM model*”, is
based on the “*theories of relativity*,” 39

laws of “*quantum physics*,”
and the simplifying assumptions
of “*isotropy*” and “*homogeneity*” of 42

the Universe. Mathematical
extrapolation of the expansion
of the Universe reversely in time back 45

Song 6: *On the Origin and Evolution of the Universe*

to its origin results in
a “*singularity*” of an infinite energy
density and temperature. Such a *singularity* 48
indicates that the “*theory*
of general relativity” is not
appropriate to describe the physical 51
nature of the Universe
at the moment of its birth (*Big Bang*).
Based on various assumptions, the “*age of* 54
of the observed Universe”
is estimated to be about fourteen
billion years old, now. The cosmic life-story 57
of our Universe may be
conjectured by mathematical
extrapolations (not by actual observations 60

Song 6: *On the Origin and Evolution of the Universe*

which are absolutely
impossible) as follows: During
the earliest short periods, called “*Planck epoch*,”⁶³
our currently known laws
of physics are not valid to
describe such an extraordinary state⁶⁶
of the newly born Universe.
In the following epoch, called
“*Grand unification*,” the four kinds of known⁶⁹
fundamental “*interactions*”
or “*forces*” began to emerge: first
the “*gravity*,” then the “*strong nuclear force*,”⁷²
the “*weak nuclear force*,” and
the “*electromagnetic interactions*.”
Then, the dense and hot young Universe rapidly⁷⁵

Song 6: *On the Origin and Evolution of the Universe*

expanded at exponential
rate during “*Inflationary epoch*.”
Its size increased enormously, and its temperature 78
decreased rapidly. Scientists
attribute the cosmic inflation
to the “*phase transition*” which produced a vast 81
repulsive force that caused
the exponential expansion, but
it is beyond my grasp. Intrinsic “*quantum* 84
fluctuations” in the state
of the very young Universe must have
been amplified by the vast cosmic inflation, 87
which resulted in various
cosmic structures, formed much later
in its evolution. During the next period 90

Song 6: *On the Origin and Evolution of the Universe*

between a pico-second and
a nano-second after *Big Bang*, called
“*Quark epoch*,” the Universe was filled with a dense 93
“*quark-gluon plasma*” which
was too energetic to form the matter
at this stage. During the next “*Hardon epoch*” 96
between a nano-second and
one second, *protons* and *neutrons* were
formed by sets of *three quarks* bound by *gluon*. 99
During the “*Lepton epoch*”
between one and ten seconds, *charged*
leptons such as *electrons*, which can combine 102
with other particles to form
atoms, or *neutral leptons* such as
“*neutrinos*,” which rarely interact with 105

Song 6: *On the Origin and Evolution of the Universe*

anything. *Protons* and *neutrons*
began to form light *atomic nuclei*
such as *helium, deuterium, tritium-* 108
nuclei during the “*proto-*
nucleosynthesis epoch” between
ten seconds and twenty minutes after 111
the presumed *Big Bang*.
But the formation of *atoms* had to
wait for an extended period of three hundred 114
eighty-thousand years until
the Universe cooled down enough so that
nuclei could combine with *electrons* to form 117
stable “*neutral atoms,*” at last.
This period is called the “*Photon epoch.*”
Photons were freed from interactions with matter 120

Song 6: *On the Origin and Evolution of the Universe*

as the previously opaque
“*plasma of nuclei, electrons, and photons*”
disappeared gradually. The Universe became 123
transparent and photons
propagated freely to become
the “*cosmic microwave background radiation*” 126
which we can detect as
“*radio-waves*” across the entire sky.
It was followed by a long “*Dark epoch*” between 129
three hundred eighty thousand
and one hundred fifty million years.
Vast clouds of *hydrogen molecules* dominated, 132
but they were not concentrated
enough by *gravity* to form “*proto-stars*”
at this stage. The *photons* of the “*cosmic*” 135

Song 6: *On the Origin and Evolution of the Universe*

background radiation” became
invisible radio waves due to
the expansion of the space. Hence, the Universe 138
looked dark. In the next period,
called “*Reionization epoch*,” between
one hundred fifty million and one billion years, 141
hydrogen molecules became
“*ionized plasma*” by *gravity*,
and the “*large-scale structures and stars*” emerged. 144
“*Dark matter*” gathered in
massive diffuse filaments by *gravity*.
Ordinary matter, attracted to dense regions 147
of *dark matter*, formed condensed
clouds of *hydrogen gas*, from which emerged
the “*primeval cosmic structures*”: “*old stars*,” 150

Song 6: On the Origin and Evolution of the Universe

dwarf galaxies, and “quasars.”

Quasars are very distant old galaxies
we can observe today. They contain “*super-*
massive black holes,” surrounded
by inward spiralling “*accretion disk*”
of gases, which emitted powerful radiations. 153 156

Most of the observed galaxies
were formed and evolved in a long
period, called “*Galaxies Formation and*
Evolution epoch” from 159
one to ten billion years after
the presumed *Big Bang*. Smaller elliptic 162
and spiral *galaxies* merge
to be a larger *elliptical*
galaxy. Many *galaxies* become bound by *gravity* 165

Song 6: *On the Origin and Evolution of the Universe*

to form a *galaxy-cluster*.
Superclusters of galaxies evolved,
each containing many galaxy-clusters in 168
enormously large extents.
The history of the Universe may be
viewed with respect to the kinds of its dominant 171
energy. The dynamics
of the early Universe were determined
by the “*radiative energy*” (*photons* and 174
neutrinos) after
its *exponential inflation*, and
until about forty-seven thousand years after 177
Big Bang, called “*Radiation-*
dominated era.” But the “*energy*
of matter” became dominant over that of 180

Song 6: *On the Origin and Evolution of the Universe*

radiation in the new phase
between forty-seven thousand and
about ten billion years, called “*Matter-dominated*” 183
 era.” Recent observations
suggest that the Universe is
expanding at increasing rates. To account 186
 for this unexpected fact,
scientists speculate an unknown form
of energy, named “*dark energy,*” which is assumed 189
 to permeate the entire space,
and accelerates the expansion
of the Universe. The accelerated expansion started 192
 about four billion years ago,
and it will keep on in the future.
The period from about ten billion years after 195

Song 6: *On the Origin and Evolution of the Universe*

the presumed *Big Bang*
to the present is called “*Dark energy-*
dominated era.” Currently scientists estimate 198
that sixty-eight percent
of the total energy of our present-day
observable Universe must be attributed 201
to the unknown “*dark energy,*”
and twenty-seven percent of its total
energy must be contributed by another 204
unknown “*dark matter.*”
The ordinary matter, which we can
perceive and have some ideas on how it works, 207
contributes only five percent
of the total energy of the Universe.
Hence, the Universe is an immense and profound 210

Song 6: *On the Origin and Evolution of the Universe*

mystery to explore.

This is a brief gist of the story
about the origin and evolution of

213

the Universe, according
to the currently prevailing “*Big Bang*”
hypothesis as much as my dull brain could
grasp its fabulous claims,’

216

says the dreamer.

218

Song 7

***Questions on
the “Big Bang” Hypothesis***

Song 7: Questions on the “Big Bang” Hypothesis

After a meditation

Dante speaks: ‘Your story of
the cosmic drama of the Universe is 3
much too abstruse, complex,
and fantastic for me to grasp,
although I trust that you told me what you 6
truly believed in. It takes
my breath away to learn that the paltry
ephemeral humans have enlightened themselves 9
to look so deep into
the fathomless mystery of
the Universe. I exalt and appreciate 12
the inquisitive spirit
and the impressive discoveries
of astounding facts, revealed by devoted 15

Song 7: Questions on the “Big Bang” Hypothesis

works of sincere scientists.
But I must confess that the “*Big Bang*”
story on a plausible origin of the Universe 18
sounds like a fantastic
fable of dark magic to me
rather than a rational hypothesis 21
which can be subjected to
rigorous scientific tests to prove
or disprove its validity.’ ‘Please explain 24
for me what you mean,’ *asks*
the dreamer. ‘If the “*Big Bang*” were
a real event which created the Universe 27
of an immense energy
at extremely high temperature,
how could it happen in reality?’ *asks Dante*. 30

Song 7: Questions on the “Big Bang” Hypothesis

‘I see your crucial point.
Authors of the “*Big Bang*” model
refuse to think about what caused it to happen, 33
claiming that their theory
has nothing to do with the “*time*
before the Big Bang,” because neither “*time*” 36
nor “*space*” existed before
the “*Big Bang*” event,’ says the dreamer.
‘That is a trite ploy how sly magicians play 39
their tricks on the poor idiots.
Do you believe that the Universe had
existed outside time and space, before it was 42
brought forth into reality
by the magic of “*Big Bang,*” alleged
by new *prophets—scientists?*’ asks Dante. 45

Song 7: Questions on the “Big Bang” Hypothesis

‘No, I cannot believe
that “*Big Bang*” happened in reality:
Its presumed creation of the Universe 48
with immense energy from
nothing violates the fundamental
“*principle of conservation of energy* 51
and matter” as well as
its logical absurdity,’
says the dreamer with a resolute stance. 54
‘If so, I wonder why
the absurd story of the “*Big Bang*”
became the prevailing cosmological theory,’ 57
says Dante. ‘I do not know.
All scientific theories are merely
provisional inventions by the ephemeral 60

Song 7: Questions on the “Big Bang” Hypothesis

yet imaginative human brains.
I guess that most humans tend to
worship miracles over plain common sense. 63

The “*Bing Bang*” story reminds
me of the “*Genesis*” attributed to Moses,
says the dreamer. ‘What? How so?’ asks Dante. 66

‘Moses claims: “*In the beginning
God created the heavens and the earth.*”
Neither Moses nor the authors of the “*Big Bang*” 69
story explain from what and how
“*the heavens and the earth were created
by God*” or “*the Universe happened to exist*” 72
“*at the moment of Big Bang,*”
says the dreamer. ‘I see your point.’
‘In the final Canto of your *Paradiso* 75

Song 7: Questions on the “Big Bang” Hypothesis

you make the Dante-pilgrim
to achieve “*Saint Thomas Aquinas’s*”
ultimate theological apotheosis to see 78
God directly in person;
Then you transform him to be
a scientist who recognized God as 81
the *eternal light—energy*,
and let him exult: “*Whence I should*
presume to fix my gaze on the eternal 84
light so intently that
my vision was consummated at last!
In their depths, bound inherently by love 87
into one volume,
the universe revealed itself as
the perfect whole of many diverse things: 90

Song 7: Questions on the “Big Bang” Hypothesis

*Substances and accidents
and their various functions seemed
to have merged together in such a way 93
that I would speak of it
as a **simple light**. The universal
form of such a unity, I think, I saw, 96
because the further I
discerned it, the more I delighted
in it. My mind attained its final wish 99
to know, as if struck with
the enlightening ray. Here ceased
the power of my high fantasy. But 102
at last all my desires
and my will revolved in harmonious
motions by the Love that moves the sun and 105*

Song 7: Questions on the “Big Bang” Hypothesis

the other stars.” This is
what inspired me to seek you, Dante,
and converse with, even in a fleeting dream. 108
Now, you enlighten me
to realize that the physical energy
must have the very timeless universal nature 111
of your theological God!’
confesses the dreamer in elation.
‘I am happy to find that you are the one 114
who sees a fleeting glimpse
of the supreme light that I’ve toiled
to convey with ineffable words in my solitary 117
confession to myself:
La Commedia!’ says Dante, beaming
affectionate smile. A silence prevails while 120

Song 7: Questions on the “Big Bang” Hypothesis

*they are immersed deep in
their thoughts. At last, the dreamer speaks:*
‘The “*Big Bang*” hypothesis is based on the alleged 123
“expansion of the Universe,”
which is indirectly inferred from
the recently observed phenomena, called 126
“red-shift” in the spectrum
of wavelengths of light, according to
its interpretation as if it may be due to 129
the receding movements
of the very remote astronomical
objects which emitted the photons (as 132
“Doppler effect”). But
the *“red-shift”* may be due to
interactions of the photons with particles 135

Song 7: *Questions on the “Big Bang” Hypothesis*

in the intergalactic
medium rather than due to
receding movements of the emitters 138
of the *red-shifted* photons.
These photons were generated very
long time ago (up to ten billion years ago), 141
and they had travelled long
cosmic distances before detected by
human observers on Earth. Their “*red-shift*” 144
may be due to a decrease
in the photon’s energy, proportional
to its age and the distance of its propagation 147
rather than due to
receding movements of its emitter.
Even if we assume that the presumed 150

Song 7: *Questions on the “Big Bang” Hypothesis*

expansion of the Universe
to be correct, the “*Big Bang*”
hypothesis has a severe logical problem: 153
It makes an unjustified
extrapolation of the presumed
expansion of the Universe reversely 156
in time back to its unknown
origin, as if the expansion had started
from, and continued since a particular point 159
of time’s flow: “*Big Bang*.”
But we can know neither when
the expansion began nor how long it has 162
been going on. Hence, we
cannot estimate the age of
the Universe from the rate of currently 165

Song 7: *Questions on the “Big Bang” Hypothesis*

inferred or *observed*
expansion of the Universe at all.
The *Big Bang* hypothesis invokes a magical 168
“*sudden birth of immense*
energy” from nothing (*Creatio*
ex nihilo) at “*Big Bang*,” violating 171
the fundamental “*principle*
of the conservation of energy
and matter” (*Ex nihilo nihil fit.*). 174
Furthermore, the “*Big Bang*”
hypothesis tries to attribute
the very recently observed “*acceleration*” 177
in the degree of “*red-shifts*”
to a “*dark energy*,” which was invoked
by its authors, as an *ad hoc* new “*holy ghost:*” 180

Song 7: *Questions on the “Big Bang” Hypothesis*

No one knows what “*dark energy*”
is, at all, but it plays a predominant
role in the “*Big Bang*” hypothesis,’ *says* 183
the dreamer. ‘If so, we must
charge that they have feigned a cunning
“*dark hypothesis*.” Following the “*Newton’s* 186
Rule 4 of Reasoning,”
we must search for new hypotheses
to replace the magical story of “*Big Bang*,” 189
I surmise,’ *says Dante*. 190

Song 8

“Ex Nihilo, Nihil Fit.”

Song 8: "*Ex Nihilo, Nihil Fit.*"

Dante and the dreamer
immerse in their profound thoughts.
Then the dreamer confesses: 'I appreciate 3
your insightful advice
deep in my heart. Yet my poor brain
cannot find the right way to see the light. 6
Please help me, Dante, how
to proceed appropriately in this deep
mysterious inner journey!' 'Our conversation 9
in this strange encounter
has raised far more critical questions
*in my mind on the faith in *God* than what* 12
*you feel about the *Big Bang**
hypothesis. Yet, we must keep on
striving to find the right way to see the truth. 15

Song 8: "*Ex Nihilo, Nihil Fit.*"

Although I am ignorant
in science, the crucial questions
on the Universe are certainly of vital 18
importance to me. Tell me
what you think of the possible
origin of the Universe,' says *Dante*. 21
'I confess that I am
utterly agnostic about such
a question on its ultimate origin, 24
as I firmly believe
that it is impossible for us
to know it without invoking the dark 27
magic of "*Creatio*
ex nihilo." But I will try
to confide to you my private opinions 30

Song 8: “*Ex Nihilo, Nihil Fit.*”

on how the Universe changes
through time in accord with the known
principles or laws of nature,’ *says the dreamer.* 33

‘You uphold the spirit
of “*Ex nihilo, nihil fit,*”
I presume,’ *says Dante.* ‘Yes, my opinion 36
is based on these postulates:

[Postulate 1] A “*universe*” is defined
by its total constituent “*matters*” and 39
“*energy,*” which are distributed
in specific patterns in “*space,*”
and by the particular changes in such 42
patterns through the flow of
“*time,*” in accord with its unique
set of “*principles*” or “*laws of nature.*” 45

Song 8: “*Ex Nihilo, Nihil Fit.*”

Although there might exist
in “*nature*” many distinct “*universes*”
which may have different “*constituents*” and 48
distinct sets of “*principles*,”
the only concrete object that is
certain to exist, is this Universe in which 51
the humans exist and
study it. Hence, my opinion is limited
to the Universe which we can investigate 54
with empirical methods.
[Postulate 2] The Universe consists
of many separate parts of two kinds, each part 57
called “*world*”: the “*ordinary world*”
which is made of ordinary matter
(*fermions*), and the “*anti-world*,” made of 60

Song 8: “*Ex Nihilo, Nihil Fit.*”

anti-matter (anti-fermions),
as postulated by “*Hannes Alfven*”
in the “*Plasma Cosmology.*” The part of 63
the Universe, which has been
observed by the humans, is
an example of “*ordinary world*” which 66
consists of many millions
of “*super-clusters*” of galaxies,
made of “*fermions.*” The apparent lack 69
of any galaxy, made of
“*anti-fermions*” in the observed part
of the Universe (the fundamental problem 72
of “*Baryon Asymmetry*”)
suggests that its corresponding
“*anti-world*” may be separated too far from us, 75

Song 8: "*Ex Nihilo, Nihil Fit.*"

beyond the reach of human's
current ability of its detection,' *says*
the dreamer. 'I see your point. The generation 78
of each pair of *matter*
and *anti-matter* from the energy
of radiation as well as their *annihilation* 81
after mutual collision
back to radiation occurs such
that the total energy is conserved and 84
the net electric charge is
balanced, as I recall what you
told me.' 'Thank you, Dante! Now, let us 87
assume that the Universe
consists of only one "*ordinary world*"
and its corresponding separate "*anti-world.*" 90

Song 8: “*Ex Nihilo, Nihil Fit.*”

When these two “*worlds*” become
“*ionized plasmas*” due to their own
gravity, the electrically attractive force 93
between them will become
much stronger than that of gravity;
Hence, the probability of their collision 96
will increase greatly.
Random fluctuations in
their previously separate movements 99
may result in their collision,
and hence, their “*mutual annihilation*”
into an immense amount of radiative energy. 102
As pairs of collided “*matter*”
and its corresponding “*anti-matter*”
become annihilated at various levels such as 105

Song 8: “*Ex Nihilo, Nihil Fit.*”

sub-atomic, atomic,
molecular, stellar, galactic,
and super-clusters of galaxies’ scales, 108
the spatial distribution
of observable objects in
the Universe will appear to contract in 111
its extent and the density
of radiative energy will increase
immensely. Consequently, the temperature 114
will rise to an extremely
high level. Hence, the collision between
the “*ordinary world*” and its corresponding 117
“*anti-world*” will produce
the extreme physical conditions,
which may be very similar to those, assumed 120

Song 8: “*Ex Nihilo, Nihil Fit.*”

by the “*Big Bang*” hypothesis,
without invoking the magic of
“*Creatio ex nihilo*,” but according 123
to the known principle
of the “*mutual annihilation*
of matter and anti-matter into 126
radiative energy.”

While the complex cosmic processes
of the mutual annihilation between 129
the “*ordinary world*” and
its corresponding “*anti-world*” proceed
from sub-atomic to super-cluster galactic levels 132
(which may take a long cosmic
period over many billion years),
the radiative energy will spread out, and 135

Song 8: “*Ex Nihilo, Nihil Fit.*”

it will generate “*fermions*”
and “*anti-fermions*” via the physical
mechanism of “*pair-production.*” Eventually, 138
a segregated ensemble
of “*fermions*” will form a new
generation of “*ordinary world*” and 141
a separate ensemble
of “*anti-fermions*” will produce
a new generation of “*anti-world.*” 144
During the cosmic
processes of production of a new
generation of separate “*ordinary worlds*” 147
and “*anti-worlds*” (which may
take a long cosmic period over many
billion years), the Universe will appear to 150

Song 8: “*Ex Nihilo, Nihil Fit.*”

expand. Such periodic changes
between “*annihilation*” and “*pair-*
production” could keep on forever throughout 153
the grand drama of
the mysterious Universe,’ *says*
the dreamer. ‘I appreciate the logical beauty 156
of your story on such a grand
cosmic drama, although I do not
know whether it would be valid in nature, 159
or not,’ *says Dante.*
‘It is merely my daydreaming,
unless future scientists would discover 162
the presumed “*anti-world,*”
or “*anti-superclusters of galaxies*”
(which are made of “*anti-fermions*”) in remote 165

Song 8: “*Ex Nihilo, Nihil Fit.*”

regions in the observable
Universe. If they would confirm it
someday (as I sincerely hope), then the postulated 168
periodic changes between
the phase of “*annihilation*” (during
which the Universe appears to contract) and 171
the phase of “*pair-production*”
(during which the Universe appears
to expand) will become a *testable hypothesis*. 174
Only a century ago, scientists
believed that the Milky Way Galaxy
was the entire Universe. Now, we realize that 177
the part of the Universe,
which we can observe, contains more
than many hundred trillion galaxies which are 180

Song 8: “*Ex Nihilo, Nihil Fit.*”

similar to our Milky Way.
Thus, it is possible that future
scientists may discover that the part which 183
we can observe now, is
only a very tiny fraction of
a larger portion of the Universe, which they can 186
observe with new methods,
unknown to us currently. Let us imagine
that there are a hundred trillion separate 189
“*ordinary worlds*” and
another hundred trillion separate
“*anti-worlds,*” moving within the immense 192
space of the Universe.
Then their probable collisions,
and hence, their “*mutual annihilations*” 195

Song 8: “*Ex Nihilo, Nihil Fit.*”

during a long cosmic
period would be statistically
certain, regular, and periodic events 198
in the Universe. Such cosmic
changes between the phase of “*annihilations*”
and the phase of “*pair-production*” will be 201
periodically reversible,
and hence will perpetuate
the Universe through eternity, while it undergoes 204
drastic changes as time flows.
This is the best what I can imagine
in accord with “*Ex nihilo, nihil fit,*” 207
as I cannot believe in
“*Creatio ex nihilo*” such as
the alleged “*Big Bang*” event at the unknowable 210

Song 8: *“Ex Nihilo, Nihil Fit.”*

“Beginning of the Universe,”
nor fear the unknowable fatal
“End of the Universe” at either the so-called 213
“Big Ripe,” due to its endless
expansion, or at the so-called *“Big Crunch,”*
due to its ceaseless contraction, as presaged by 216
our currently prevailing
cosmology,’ *says the dreamer.*
‘I respect your apt efforts to balance 219
the Universe to be
perpetual with reversible and
periodic variations. Be brave to uphold 222
what you truly believe in,’
says Dante. ‘Another aspect
of the Universe, which all future scientists 225

Song 8: “*Ex Nihilo, Nihil Fit.*”

should consider, I think,
is the physical nature of
the “*fundamental constants*” such as 228
“*Newton’s constant of*
Gravitation,” “*Planck’s constant*” in
quantum physics, “*Boltzmann’s constant*” in 231
statistical mechanics,
the “*electric charge*” and “*speed of light*”
in electromagnetism. They have been assumed 234
to be outside of time and space,
as if they were permanent forever
and everywhere, like the faith in God. 237
But all our measurements
of their values were made only recently
within the past two hundred years. We do not 240

Song 8: “*Ex Nihilo, Nihil Fit.*”

have any experimental proof
that their values do not change over
a long cosmic period. If the “*fundamental* 243
 constants” undergo
“*periodic changes*” between *increasing phase*
and *decreasing phase* of their values over long 246
 cosmic periods, then
our theories of physics must be
adjusted to replace the “*fundamental constants*” 249
 by their corresponding “*time-*
 dependent fundamental parameters,” ’
says the dreamer. ‘I cannot grasp what you 252
 are dreaming, as I know
nothing of the esoteric and
abstruse theories of your science. But I think 255

Song 8: "*Ex Nihilo, Nihil Fit.*"

that all changes occur with
respect to *time*. Do you agree with me?’
‘Yes, of course, Dante!’ ‘But I do not know 258
what “*time*” really is, although
we speak of “*time*” so easily, as if
we knew it perfectly than anything else. 261
Let us discuss on
the nature of “*time*,” first of all,
rather than to argue pretentiously 264
at what point of *time*, and how
it happened that the Universe began
to exist, and at what *time* it will cease to be.’ 267
‘Yes, Dante. Please lead me
to behold a glimpse of the deep
mystery of “*time*,”” says *the dreamer*. 270

Song 9

On the Nature of Time

Song 9: *On the Nature of Time*

‘When I speak to you now:
“*I hope to discuss with you tomorrow*
noon about what time is,” what do you think 3
that I have meant?’ *asks Dante.*

‘You put my poor brain at a hard test.
To make your utterance to be meaningful 6
your brain assumed something
we call “*time*” as if we know it
implicitly, although we cannot expound it 9
explicitly. We presume
that “*time*” flows from the “*past*” to
the “*present,*” and then keeps on flowing into 12
the “*future,*”’ *says the dreamer.*

‘Yes, we must presuppose it;’ *says*
Dante, ‘Now tell me what you mean by “*past,*” 15

Song 9: *On the Nature of Time*

“*present*” and “*future*” of “*time.*”
‘They are subjective arbitrary
demarcations of sequential occurrence 18
of “*events*” along the “*linear*
progression” of “*time,*” I surmise;
“*Present*” or “*now*” is the point of time 21
at which a human happens
to “*speak.*” Any event which occurred
“*before*” the current “*speaking event*” is deemed 24
to be in the “*past,*” whereas
any event, which is expected to
occur “*after*” speaking, is considered to be 27
at a “*future point*” in
the “*flow of time.*” I know that it is
merely a circular tautology. Please help 30

Song 9: *On the Nature of Time*

me Dante how I should
proceed with “*time*, ”” *confesses*
the dreamer. ‘I am on the very same mysterious 33
boat of “*time*, ” sailing with
all others across the sea of being.
I concur with you that our words “*present*, ” 36
“*past*, ” and “*future*” have not any
objective meaning. Do you suspect
that “*time*” is a fancy “*phantom*, ” conjured up 39
by the human brains?’ *asks*
Dante. ‘I believe that “*time*” is one
of the most fundamental “*quantifiable entities*” 42
of the Universe—the very
essence of the ultimate
“*reality in itself*: ” Any real “*thing*” or “*event*” 45

Song 9: *On the Nature of Time*

depends on its very “*existence*”
or actual “*occurrence*” on the “*pre-*
condition” of the “*flow of time*” along 48
the quantifiable linear
sequence of “*moment-points*” of “*time*,”
as argued by philosopher “*Immanuel Kant.*” 51
‘How do scientists deal with
“*time*” objectively?’ asks *Dante*.
‘Most scientists refrain from arguing what “*time*” 54
may be with circular words,
but all of them work hard to “*measure*”
the number of observed occurrences of specific 57
cyclic physical events,
as accurately as possible.
As early as six thousand years ago, various 60

Song 9: *On the Nature of Time*

ancient civilizations
developed their particular methods
of “*time-keeping*,” called “*chronometry*.” 63

Based on observations
of the movements of the Moon, the Sun,
and other heavenly bodies across the sky, 66

the ancient astronomers
devised various “*calendars*”
in terms of *days*, *months*, and *years*, to organize 69

sequential “*events*” in
the coherent chronological order
and “*intervals of time*,”” says the dreamer. 72

‘The establishment of
the standard calendar has been
of the most vital importance for all 75

Song 9: *On the Nature of Time*

human societies, I think,
because it provides the *common*
reference of time, which regulates all 78
human activities: we live
in accord with the calendar.
The meaning of all historical events 81
depends entirely on
the standard calendar which records
the journey of our life,’ *asserts Dante* 84
with sincere confidence.
‘Absolutely, I concur with you
on the vital importance of the “*calendar*” 87
as the “*common reference*
of the regular flow of time.”
Many scientists have endeavoured to improve 90

Song 9: *On the Nature of Time*

the accuracy of
their contemporary calendars
throughout human history: They invented 93
various “*time-keeping devices*,”
called “*clock*,” “*timepiece*” or “*watch*.”
They are used to “*measure intervals of time*” 96
shorter than the natural
intervals of the “*day*,” the “*lunar month*,”
and the “*year*,” estimated by astronomical 99
observations. A “*day*” is
divided into shorter units of
twenty-four “*hours*,” an “*hour*” is divided 102
into further shorter units
of sixty “*minutes*.” A “*minute*”
is defined to consists of sixty “*seconds*.” 105

Song 9: *On the Nature of Time*

According to the “*Mean Solar Time system*,” the “*mean solar day*” is defined as the *mean time interval* 108
between two successive
passages of the Sun across the *local meridian* at “*noon*.” But modern scientists 111
discovered that the apparent
movement of the Sun due to the daily
spinning of the Earth cannot be taken as 114
an absolute standard
of time interval, because the actual
duration of the “*mean solar day*” increases 117
very gradually due to
the “*tidal effects of the oceans*,”
which slow down the spinning speed of the Earth,’ 120

Song 9: *On the Nature of Time*

says the dreamer. ‘I see.

I admire the remarkable advance
in the time-keeping, achieved by the scientists 123

who did not waste their time
in prattling on whether time is
is real or unreal, but devoted their time 126

to *measure time* as
accurately as possible. Now, I
wonder how the scientists solved the severe 129

problem to establish
a proper standard in measuring
time,’ *says Dante with genuine curiosity.* 132

‘They made revolutionary
improvements of various new “*time-*
measuring devices.” The most accurate 135

Song 9: *On the Nature of Time*

new devices, called the “*atomic
clocks,*” measure the specific
“*electromagnetic signals*” which the moving 138
“*electrons*” emit within
a particular atom when they change
their “*quantum state*” from one energy level 141
to another level
within the same atomic structures.
Since 1967, the International System 144
of Units has defined
“*One Second*” as the duration
of 9192631770 cycles of radiation 147
that is emitted by
the transition of electrons between
two “*quantum states*” of the “*cesium-133 atom*” 150

Song 9: *On the Nature of Time*

at rest and at “*Kelvin*
temperature of absolute zero degrees.”
The accuracy of the “*cesium atomic clock*” 153
(NPL-CsF2) was estimated
to be correct within one second
for about 138 million years. National standards 156
agencies in many countries
around the world maintain a network of
different atomic clocks which are inter-compared 159
and kept synchronized to
a high accuracy of within
one “*nano-second*” per day. These various 162
atomic clocks collectively
define a continuous and reliable
“*time scale:*” the “*International Atomic Time.*” 165

Song 9: *On the Nature of Time*

Many scientists are working
to improve the accuracy and
efficiency in *measuring time* with new clocks 168
which are expected to remain
correct during an eonian period
of fifteen billion years long, ” *says the dreamer.* 171

Song 10

Measuring the Time Past

Song 10: *Measuring the Time Past*

*Dante immerses in deep
meditation while time keeps moving
through eloquent silence. At last, he speaks:* 3
‘I am deeply impressed
to learn how the scientists investigate
the nature of time, even though I lack 6
the knowledge of physics.
I wish to feel myself how long
a second is.’ ‘It is roughly the interval 9
between two consecutive
beats of our heart at the rest state,’
says the dreamer. ‘Now, I feel it at heart,’ 12
*exclaims Dante, touching
his own heart,* ‘I remember from
our preceding conversation on *Journey of Life* 15

Song 10: *Measuring the Time Past*

you mentioned how old
a specific fossil was or how long ago
an event occurred. Certainly, it is 18
absolutely impossible
for you to have any direct knowledge
of such things in the remote time past as 21
you did not exist then.
Now, tell me how did you or someone
measure the ages of materials or events 24
which occurred in the remote
times past,' *says Dante with sincere*
curiosity. 'All materials are formed by 27
various combinations
of basic units of matter, called
"chemical elements." Each "element" is 30

Song 10: *Measuring the Time Past*

composed of its specific
number of “*protons*” in its atomic
nucleus, called its unique “*atomic number.*” 33

The same “*element*” can exist
in many different “*isotopic*” forms:
Various “*isotopes*” of an “*element*” have 36
different number of
“*neutrons*” in the “*atomic nucleus,*”
says the dreamer. ‘How such esoteric affairs 39
inside the infinitesimal
nucleus of an atom have anything
to do with your business in measuring age?’ 42
asks Dante. ‘Scientists
discovered that some *isotopes*
of a specific *element* undergo spontaneous 45

Song 10: *Measuring the Time Past*

changes into different
isotopes of the same element,
or “*transmutation*” to become a different 48
element via various *nuclear*
physical processes, called “*radio-*
active decays.” Although the moment in time 51
at which a particular
atomic nucleus “*decays*” cannot
be predicted, a collection of a massive 54
number of radioactive
nuclei undergoes a regular
isotopic decay in the *exponential* 57
time-course, called “*age equation*”
with its specific parameter,
called the “*half-life*.” After the period of 60

Song 10: *Measuring the Time Past*

one *half-life* has elapsed,
one-half of the atomic nuclei
of the “*parental isotopic form*” would have 63
decayed into its
descendant isotopic form, called
“*decay product*. ”” ‘It sounds too fabulous 66
like fanciful tales in
fantastic fables,’ *interrupts Dante*,
‘Tell me some concrete examples of such things 69
which exist in the real world.’
‘I will try my best: “*Tritium or*
hydrogen-3” is a rare radioactive 72
isotope of the lightest
element “*hydrogen*. ” The atomic
nucleus of *tritium*, called “*triton*, ” consists 75

Song 10: *Measuring the Time Past*

of two “*neutrons*” and one
“*proton*,” in contrast to the stable
“*isotope hydrogen-1*”, called “*protium*,” which 78
has only one “*proton*.”
Tritium can be produced artificially
by irradiating “*lithium*” metal in a “*nuclear* 81
reactor.” The unstable
tritium decays into the stable
protium by emitting “*beta-ray*” in 84
its specific time-course
with a “*half-life*” of about twelve years.
“*Carbon-14*” is a radioactive isotope of 87
the element “*carbon*.”
Its atomic nucleus consists of
six *protons* and eight *neutrons*. The unstable 90

Song 10: *Measuring the Time Past*

“*carbon-14*” undergoes
the “*radioactive beta decay*”
to become a different element, called 93
“*nitrogen-14*” which is
a stable isotope of the element
“*nitrogen.*” The decay of “*carbon-14*” 96
occurs in the time-course
with the *half-life* of about five thousand
and seven hundred years. “*Carbon-14*” can 99
be used as a reliable
method for radiometric dating
the ages of “*carbonaceous*” materials 102
such as archeological
samples of various remains of
organisms which lived in the time passed up to 105

Song 10: *Measuring the Time Past*

about sixty thousand years old.
For measurement of absolute ages
of various rocks and fossilized organisms, 108
 “Uranium-lead radiometric
dating” method is commonly used.
This is quite reliable method, because 111
 rock samples provide two
independent measurements, *“two clocks*
of radioactive decays:” one is based on 114
 the time-course of the decay
of *“uranium-235”* into *“lead-207”*
with a *half-life* about seven hundred million 117
 years. Another measurement
is based on the decay time-course
of *“uranium-238”* into *“lead-206”* 120

Song 10: *Measuring the Time Past*

with a much longer *half-life*
of about four and a half billion years.
The two-independent measurements of 123
the same sample provides
a built-in cross-check,' *says the dreamer.*
'I see. Now I am convinced to believe what 126
you've told me are all real,
although it is too hard for me
to realize as facts. What is the longest 129
half-life of an unstable thing?'
asks Dante with earnest curiosity.
'The longest half-life of radioactive 132
isotope is about seven
million billion years long in the case
of "*samarium-148*" which undergoes via 135

Song 10: *Measuring the Time Past*

“*alpha decay*” to transmute
into the isotope of the element
“*neodymium-144,*”” *says the dreamer* 138
elated in sheer excitement.

‘What? If it is true, then the half-life
of the so-called *unstable material* must be 141
a half-million times longer
than the entire age of the Universe,
claimed by the *Big Bang* story,’ *exclaims Dante* 144
in surprise and disbelief.

‘Explain to me how scientists
could actually measure such an immense 147
interval of time,’ *demand*
Dante. ‘I appreciate your keen
logical inquiry. The parameter, “*half-life,*” 150

Song 10: *Measuring the Time Past*

is calculated from
the temporal changes in the ratio
of the number of the parental unstable
atomic nuclei to that of
the stable “*decay product*,” measured
at many time-points in the course of the radio-
active decaying processes. 153
The number of atomic nuclei
of each isotopic type can be measured 159
with a “*mass-spectrometer*”
at every time-point of sequential
experiments. Hence the changes in the *ratio* 162
with respect to many time-points
can be plotted by concrete experiments,’
says the dreamer. ‘I see. But I wonder 165

Song 10: *Measuring the Time Past*

how long so-call *stable thing*
last without decaying. Would it last
forever?’ *asks Dante*. ‘We do not know it. 168

Many scientists had been looking
for an occurrence of “*decay of*
proton” in various experiments, but thus far 171

none of them succeeded in
finding the hypothetical *decay*
of proton,’ *says the dreamer sincerely*. 174

‘I must admit that
your story about the transmutation
of one element into a different element 177

sounds to me like a fancy
alchemy, played by a magician
rather than a serious work of sincere 180

Song 10: *Measuring the Time Past*

good scientists,' says *Dante*
beaming subtle smiles. 'I feel the same
way as you do. But they are real facts which 183
are established by concrete
experiments of "*nuclear physics,*"
pioneered by the outstanding scientist 186
"*Ernest Rutherford*" and
his many colleagues. The spontaneous
decays of the atomic nuclei are governed 189
by the "*weak nuclear force*"
which is one of the four most fundamental
laws of nature, along with the "*strong nuclear* 192
force," "*gravitation,*" and
"*electromagnetism,*" says the dreamer. 194

Song 11

Mother Earth: The Planet of Life

Song 11: *Mother Earth: The Planet of Life*

‘Your story is hard to grasp;
And yet it is very challenging and
fascinating to imagine something beyond 3
what I could ever imagine.
As we talked about how to measure
the ages of things, let us converse on when 6
our Mother Earth came to be,
and how she happened to nurture
the primordial life to emerge and begin 9
its mysterious journey
from the time-point of its origin
to the present as we discuss such esoteric 12
events,’ says *Dante*.
‘Certainly, Dante, I wish to
converse with you on such topics of vital 15

Song 11: *Mother Earth: The Planet of Life*

importance. The “*geological time scale*” provides a basic frame
of time for the history of our planet Earth: 18

It is divided into
four primary long time-intervals,
called, the “*Hadean Eon*,” the “*Archean Eon*,” 21
the “*Proterozoic Eon*,”
and the “*Phanerozoic Eon*,”
in descending temporal sequence from 24
the formation of Earth
to the present point in the time’s flow.

Each “*eon*” is subdivided into its various “*eras*. ” 27

Each “*era*” is divided further
into its “*periods*,” which in turn divided
into “*epochs*,” and each “*epoch*” is divided 30

Song 11: *Mother Earth: The Planet of Life*

further into its “ages,”” says
the dreamer. ‘I see. It seems to be
a good systematic scale of time. How long 33
is an eon?’ asks *Dante*.
‘It varies: the “*Hadean Eon*” represents
the time-interval between the formation of 36
the planet Earth at about
four and a half billion years ago
and the time-point of four billion years ago. 39
The “*Hadean Eon*” remains
darkly shrouded in enigmatic mysteries.
The “*Archean Eon*” represents the time-interval 42
between the emergence of
the primordial “*prokaryotic life*”
or earlier “*proto-life forms*” at about four billion 45

Song 11: *Mother Earth: The Planet of Life*

years ago and the later
time-point of about two and a half
billion years ago. The “*Proterozoic Eon*” 48
spanned between the two time-points
from two and a half billion years ago
and to five-hundred forty-one million years 51
ago. The youngest current
“*Phanerozoic Eon*” represents
the shorter time interval between the time- 54
point of five-hundred forty-one
million years ago and the time-point,
we say “*present*” or now,’ says *the dreamer*. 57
‘I wish very much to learn
how our Mother Earth had emerged
during the Hadean Eon as a planet which 60

Song 11: *Mother Earth: The Planet of Life*

brought forth the primordial life,
and nurtured its mysterious journey
of evolution,' says *Dante with genuine* 63
curiosity and enthusiasm.

'What concrete events occurred during
the very early and darkly "*Hadean Eon*" 66
remain unknown to us.

According to the "*nebular*
hypothesis," our "*Solar System*" began 69
to form from a tiny part
of an immense "*interstellar*
molecular cloud" by "*gravitational collapse*" 72
about 4.6 billion years ago.

Most of its mass became concentrated
into the gravitational center, which became 75

Song 11: *Mother Earth: The Planet of Life*

later the massive “*Sun*,”
Whereas its smaller remainders
became flattened into a “*protoplanetary disc*,” 78
presumably triggered by
powerful “*shock waves*” of colossal
“*supernova explosions*.” The “*protoplanetary* 81
“*disc*” was the basic source
from which the “*planets*,” “*moons*,” “*comets*,”
“*asteroids*,” and other smaller objects which orbit 84
around the Sun were evolved
to form the “*Solar System*,” we surmise,
says the dreamer. ‘I see. How did scientists 87
measure the age of Earth?’
asks Dante. ‘The radiometric
dating of the mineral, called “*zircons*,” in rocks 90

Song 11: *Mother Earth: The Planet of Life*

collected from “*Jack Hill*,”
Australia, reveal the estimated ages
of their crystallization to be up to 4.4 93
billion years old. Furthermore,
the “*oxygen isotopic*” compositions
of some of the *dated zircon* indicate that 96
there were “*seas*” on the Earth
at least 4.4 billion years ago. It is
remarkable to note that the ages of the lunar 99
rocks, collected by the human
astronauts from 1969 to 1972,
range from 3.1 to 4.4 billion years old!’ 102
‘It is an astounding
agreement, indeed,’ *exclaims Dante*
with sheer excitement, ‘How did the Moon form?’ 105

Song 11: *Mother Earth: The Planet of Life*

‘Many scientists postulate
that the “*Earth-Moon system*” was formed
after a catastrophic collision between 108
the “*proto-Earth*” and
a hypothesized “*proto-planet*,”
named “*Theia*,” which had a size about that of 111
the solid planet, “*Mars*.”
According to the “*giant impact*
hypothesis,” the collision happened about 114
4.5 billion years ago.
Its impacts might have resulted in
the ejection of materials from “*Theia*” and 117
the “*proto-Earth*,” from which
two moons were formed first, and then
they merged to be a single body, the “*Moon*.” 120

Song 11: *Mother Earth: The Planet of Life*

Furthermore, “*Theia*” might have
come from the outer solar system,
and contributed its materials to the “*proto-* 123
Earth,” Most water on Earth
might have been brought by “*Theia*,”” says
the dreamer. ‘It is an awesome and fascinating 126
story of the chaotic and
violent events in the hellish
darkly time-past,’ says *Dante in awe*. 129
‘Such collisions among many
planetary bodies seem to be quite
common events during the darkly “*Hadean Eon*.” 132
Between 4.1 and 3.8 billion
years ago, numerous asteroids and
comets impacted Earth and Moon: so-called, 135

Song 11: *Mother Earth: The Planet of Life*

the “*Late Heavy Bombardment.*”
But I must confess that what I’ve
babbled afore are merely our provisional 138
conjectures on the *Hadean Eon*.
The internal structure of the Earth
was formed at an earlier time: the deepest 141
“*solid hot inner core,*” the liquid
“*outer core,*” “*mantle,*” highly viscous
“*asthenosphere,*” the solid “*crust,*” and 144
the outermost rocky layer,
“*lithosphere.*” These layered structures
of concentric spherical shells formed the Earth. 147
“*Proto-Earth*” was initially
in a molten state due to extreme
“*volcanism*” and frequent collisions with 150

Song 11: *Mother Earth: The Planet of Life*

other planetary objects.
Eventually, its outer layer cooled
to form the solid crust. Continual volcanic 153
eruptions and “*outgassing*”
created its “*primordial atmosphere.*”
Condensation of water vapour and ice, 156
brought by bombarding comets
from the cold outer solar system,
produced the “*primordial oceans,*” in which 159
various organic materials,
necessary for a later emergence
of primitive organisms, were accumulated. 162
This is a concise gist of
our current provisional conjectures
on what might have happened in the chaotic, 165

Song 11: *Mother Earth: The Planet of Life*

violent, and darkly
“*Hadean Eon*,” during which our Mother
Earth underwent a mysterious gestation 168
to give birth to her first
living organisms, we conjecture,’
says the dreamer. Dante is immersed in 171
meditation, wandering
in his inner realm in solitude.
‘I remember that our Mother Earth will be 174
engulfed by our expanding
Sun as an enormous *red-giant-star*
in five billion years as you asserted afore,’ 177
says Dante solemnly.
‘Yes, I confirm it,’ *says the dreamer.*
‘Then, all life will perish as Mother Earth 180

Song 11: *Mother Earth: The Planet of Life*

evaporates into hot
scorching flames of the burning Sun:
The tragic end of the Journey of Life...'
whispers Dante to himself.

Song 12

What is Life?

Song 12: *What is Life?*

*At last, Dante awakes from
his meditation and whispers to
himself: ‘What is life? When I don’t think of it, 3*
I feel as if I know *life*
better than anything else; but when
I muse on *life*, I get helplessly lost.’ 6

‘I feel the same as you
say, Dante, although I talked about
“*life*” as sincerely as I could in our previous 9
conversation: “*Journey of Life*
on Earth,”” confesses the dreamer.
‘*Life* seems to be so elusive as *time* is,’ 12
says Dante. ‘Yes. I feel
that “*life*” shares a similar mystery
with “*time*.” A “*living organism*” is 15

Song 12: *What is Life?*

an “*entity*” made of
concrete “*substances*.” In contrast, “*life*”
is a specific set of subtle “*processes*” or 18
“*qualities*,” which are uniquely
characteristic to a living organism
rather than its “*material substances*,” I think. 21
Such “*living processes*” are
sustained only for the timespan
during which the organism is active in 24
its “*living state*.” When
the organism disintegrates at death,
it ceases irrevocably its living processes, 27
even if certain physical
remains of the dead organism
such as its crystalized DNA molecules 30

Song 12: *What is Life?*

may last for a long time.
For example, a complete genome
of a Neanderthal was recovered from fossilized 33
bones, and its DNA sequences
were obtained after its death at about
fifty thousand years ago,’ *says the dreamer.* 36
‘Despite the circularity,
I like the idea that *life* should be
regarded as the *living processes of organisms* 39
only during they are alive.
Can you provide other examples
that support such a contentious argument?’ 42
asks Dante. ‘Let me present
the case of “*viruses*” to you to test
whether it may support the argument or not: 45

Song 12: *What is Life?*

A “*virus*” is a very small
infectious agent who can replicate
itself only inside its infected host cells 48
of a living organism.
When it is not inside its host cell
or in the process of infecting its host cell, 51
a “*virus*” assumes
its “*dormant state*” as an independent
infectious agent, called a “*virion*”; it is 54
made of the genetic
material, either single-stranded
RNA or single or double-stranded DNA, 57
which will encode its viral
proteins when the “*virion*” assumes
its “*active state*” after infection of its host 60

Song 12: *What is Life?*

cell as a “*virus*. ” It can
reproduce multiple copies of
itself via “*self-assembly*” by borrowing 63
its host cell’s metabolic
facilities. Viral genomes undergo
“*mutations*, ” which are genetically inherited. 66
Hence, they are subjected to
“*natural selection*. ” A “*virion*”
has a protein coat, called “*capsid*, ” which 69
encapsulates and protects
its genome. The *capsid* is made from
proteins, encoded by the viral genome; 72
Virally encoded protein-
subunits assemble themselves into
its specific *capsid*, presumably regulated 75

Song 12: *What is Life?*

by specific association
of viral capsid proteins with
viral RNA or DNA, called “*nucleocapsid.*” 78
“*Viral species*” have much greater
genomic diversity than that of
bacteria, archaea, plants, and animals. 81
“*Virions*” are ubiquitous
complex organic compounds which
can persist in harsh environments much longer 84
than any organism can,’ says
the dreamer. ‘Your fascinating story
of the reversible transitions between 87
the active state as *virus*
and the dormant state as *virion*
of the same physical entity provokes 90

Song 12: *What is Life?*

a soul-searching question
on the nature of life. I wonder
whether your story may be regarded as 93
a proof for *the resurrection*
of the dead back to life, or not,
says Dante in a sincere and reflective tone. 96
‘I do not imply nor
believe that a human being or
other complex organisms might be able 99
to undergo reversible
transitions between their “*living state*”
and “*disintegrated dead state,*” as presumed 102
in our fabulous mythologies
and miracles in religious scriptures.
But let me tell you another story which 105

Song 12: *What is Life?*

may be relevant to us.
It is about the human “*sperm-cells,*”
says the dreamer. ‘You are a good story-teller. 108
I am ready to hear more
of your fascinating stories,’ *says Dante.*
‘I think that the “*sperm-cells*” share remarkable 111
similarity with “*virus-*
virion”: The cytoplasm of a sperm-
cell is very scanty and lacks the essential 114
metabolic facilities
of usual living cells such as
the much larger and richer “*egg-cell,*” *says* 117
the dreamer. ‘I remember
that was what I heard from you about
the crucial event *fertilization* which set forth 120

Song 12: *What is Life?*

an individual's journey
of life,' says *Dante*. 'If we compare
the *sperm-cell* to the "*virus-virion*," then 123
the "*egg-cell*" may be compared
to the "*host-cell*" of the "*virus-*
virion," I think,' says *the dreamer in sheer* 126
excitements. 'If so, do you
think that the *fertilization*
should be compared to the *infection* of 129
the *host-cell* by *virus*?'
'Yes, I think so: "*Viral infections*"
can result in the "*horizontal gene transfer*" 132
between different species,
which is analogous to the "*temporal*
gene recombination" of the sexual process 135

Song 12: *What is Life?*

of the “*fertilization*.”
Both the “*viral infection*” and
the “*fertilization*” have the same biological 138
effect: the “*increase of*
the genetic diversity of organisms”
through the “*flow of time,*” asserts the dreamer. 141
‘I see. It is a very
coherent argument,’ says *Dante*.
‘Furthermore, the “*sperm-cells*” can be kept in 144
“*dormant state*” for a long
timespan without being disintegrated into
“*dead state*” by rapidly freezing and storing them 147
at a very low temperature
in “*cryo-laboratory*.” There are legal
facilities, called “*sperm banks*” which obtain 150

Song 12: *What is Life?*

“*sperms*” produced by healthy men,
and preserve them at low temperature
in their *cryo-facilities* for various periods 153
up to two decades, and provide
such “*donated sperms*” for certain women
to achieve pregnancy by means of “*artificial* 156
insemination.” There are
numerous healthy human beings who
were born via such methods. Statistics reveals 159
that the rate of birth-defects
is significantly lower in the case
of birth via donated sperm than that of natural 162
conception, presumably
due to careful selection of sperm-
donners, and medical checks of donated sperms 165

Song 12: *What is Life?*

over a half-year quarantine,’
says the dreamer. ‘It is, indeed,
an incredible story,’ *says Dante in deep thought.* 168

‘Recently physicians
could extract sperms from men soon after
their death, preserved them in inactive frozen state, 171
then inseminated them
successfully into lively women.

There are about two hundred such cases in which 174
healthy human babies were born
due to the human sperm-cells, extracted
after the death of their biological fathers,’ *says* 177

the dreamer. ‘The boundary
between *life* and *death* becomes so vague
and subtle,’ *mutters Dante rapt in deep thought.* 180

Song 12: *What is Life?*

‘The artificial methods
of human reproduction, called
“*in vitro fertilization*,” raise critical 183
questions of vital social
and ethical importance,’ says
the dreamer with severe and sincere concerns. 186
‘What is an artificial
fertilization?’ asks Dante.
‘It is the method for fertilization 189
of eggs-cells, collected from
the woman’s reproductive organ,
with the man’s sperm-cells in artificial liquid 192
environment outside
her body in a glass culture dish:
When the eggs and sperms are “*co-incubated*” 195

Song 12: *What is Life?*

in the culture dish, they form
“zygote” with two pronuclei. When
it develops to the “*cleavage stage*” between 198
two and four days after
co-incubation, or the “*blastocyst*
stage” (five or six days after co-incubation), 201
the embryos are transferred
from the culture dish and implanted
into the uterus of the same woman who 204
produced the egg-cells, or
into the uterus of a different
woman who will be the surrogate mother. 207
Such “*assisted reproductive*
technology” has been used to treat
various “*infertility*” and to provide 210

Song 12: *What is Life?*

“surrogacy of gestation.”

About eight million children were born
so far by the artificial fertilization method. 213

The method produces extra-
human embryos that are leftover
from a given case of implantation. 216

These *“in vitro human
embryos”* are usually preserved
at very low temperature in *“cryo-banks”* for 219
various use in the future.

They can be used for more successive
pregnancies of the same women who produced 222

the egg-cells. The human
embryos may be donated or
sold to a third party for implantation 225

Song 12: *What is Life?*

to another woman for
reproduction. In other cases,
the frozen human embryos are donated 228
for medical researches, which
require the use of the “*stem cells*” of
the embryos rather than for reproduction. 231
The “*frozen in vitro*
human embryos” have been proved to
develop to normal healthy children, when 234
they are thawed and implanted
to the nourishing woman’s “*uterus*”
after their prolonged “*inactive dormant state*” 237
in the cryo-facilities
up to sixteen years so far tested.
Hence, the existence of “*inactive dormant*” 240

Song 12: *What is Life?*

state” should be regarded as
a universal property of organisms:

It is the conditions of the environment
that determine the allowed
state which an organism may assume:

Either “*actively living state*,” “*inactive*
dormant state,” or “*dead*
disintegrated state,”” says the dreamer.

243

246

248

Song 13

*Are other Intelligent Civilizations
in the Universe?*

Song 13: *Are other Intelligent Civilizations in the Universe?*

‘Life is too mysterious
for me to understand it, yet so
intimate to feel it closer than anything else. 3

Do you think that primordial
organisms came from the complex
compounds *virion-virus* through esoteric 6
long gestation of Earth
during the Hadean Eon?’ *asks Dante.*

‘We do not know how the first organisms 9
originated during
the Haden Eon from their constituent
“*macromolecules*” as yet. According to 12
the prevailing hypothesis,
called “*RNA world*,” some kinds of
RNA molecules which could replicate 15

Song 13: *Are other Intelligent Civilizations in the Universe?*

themselves prevailed before
the emergence of DNA and proteins
in the early stage of the evolution of life. 18

RNA has very versatile
functions: it can store and replicate
genetic information like DNA does. 21

RNA can also catalyze
chemical reactions like enzymes
made of proteins do. The scientific field 24

which investigates the origin
of life, called “*abiogenesis*,” aims
to find out the natural processes by 27

which complex molecules
were transformed into an “*open system*”
which acquired the new biological functions 30

Song 13: *Are other Intelligent Civilizations in the Universe?*

such as metabolisms via
interactions with its environment,
replication of its genetic materials, 33
and gradual changes which lead
to its evolution,’ *says the dreamer.*
‘Do you think that there are various other 36
kinds of *life* in the Universe?’
asks Dante. ‘I hold a private faith
that “*life*” is a common or even “*universal* 39
phenomenon” that has been
substantiated by numerous diverse
kinds of “*cosmic organisms*” in various 42
regions of the Universe,’
confesses the dreamer his personal
opinion. ‘I felt that you believed in 45

Song 13: *Are other Intelligent Civilizations in the Universe?*

such a *cosmic religion*,
when we happened to come across
into this strange encounter. But what 48
evidence do you have for
such a cosmic faith?’ *asks Dante*.
‘It is a task beyond my fleeting paltry 51
life. I entrust it
to the future scientists in “*astro-*
biology” with a resolute confidence 54
and heartfelt enthusiasm.
At present, remotely controlled
“*space rovers*” are searching for evidence of 57
extraterrestrial organisms
on the surface of our nearest
planet Mars. They plan to send more unmanned 60

Song 13: *Are other Civilizations in the Universe?*

“*space probes*” to other
planetary objects in the Solar
System,’ *says the dreamer*. ‘Do you expect 63
that the future humans
will find other kinds of *intelligent*
civilizations in the Universe?’ *asks Dante*. 66
‘I cannot know it, at all,
as my frail brain will perish long
before humans could adventure to other 69
inhabitable “*exoplanets*”
to find out whether other kinds
of “*cosmic civilizations*” exist, or 72
have left concrete evidences
of their past existence, or not,’
says the dreamer with earnest humility. 75

Song 13: *Are other Intelligent Civilizations in the Universe?*

‘In my youth, I used to
lookup mysterious stars shining
in the clear night sky and dreamed of wondrous 78
angels who lived on the stars.
How deep I wished to meet them, and
share with them what we think and how we feel 81
at heart! When young Beatrice
appeared to me for the first time,
I felt that she was not a mortal human 84
but an angel who had come
from her star to visit us,’ says
Dante musing in his cherished reverie. 87
‘I remember your lofty
imaginative spiritual visits
of the celestial realms, guided by your beloved 90

Song 13: *Are other Intelligent Civilizations in the Universe?*

angel Beatrice, Dante,
in your sublime *Paradiso*,’ says
the dreamer with heartfelt admiration. 93

‘Let your pure creative
imaginations free you from strict science
to sing of the *cosmic intelligence*, pervading 96
the Universe! Try to dream
up other intelligent cosmic beings
who may be musing upon the profound mystery 99
and the sublime harmony
of nature, and their own miraculous
existence on their planets somewhere and 102
sometime in the cosmic
drama of our Universe. I hope
that such beautiful dreams come true someday 105

Song 13: *Are other Intelligent Civilizations in the Universe?*

in your cosmic drama,’
says Dante with sincere encouragement.
‘Thank you, my revered poet. But I must 108
confess that such cosmic
task is far beyond my paltry
lot and wit: I know that I’m not a *Dante*;
Nor there is a *Beatrice* 111
who would guide me in such an astral
journey. I am a worthless shade of nobody,
fleeting back to the void. 114
Before I perish soon for good,
I wish to confide to you what I’ve toiled 117
to sing deep from my heart:
It was about the “*sacred conscience*”
of human beings,’ *says the dreamer in awe.* 120

Song 13: *Are other Intelligent Civilizations in the Universe?*

‘Of course, I love much more
to hear about your epic on human
conscience than on the dry abstruse topics 123
of science. What is your title?’
says Dante with genuine enthusiasm.
‘The main protagonist in my story is 126
the ancient Greek hero
Odysseus, but I have not decided
on its final title as yet. Please help me 129
to choose a proper one,’
says the dreamer. ‘Odysseus in Homer’s
sublime epics, *The Odyssey* and *The Iliad* ?’ 132
asks Dante in surprise.
‘Yes! I wish to acknowledge that you
inspired me to rethink about the Homer’s 135

Song 13: *Are other Intelligent Civilizations in the Universe?*

character *Odysseus*,’ says
the dreamer. ‘What? How could I have
anything to do with the great Homer’s character 138
Odysseus?’ asks Dante.
‘In the Canto Twenty-Six of
your *Inferno*, you have portrayed *Odysseus* 141
in a new dramatical
invention, in contrast to the old
Greek legend, called “*Telegony*:” According to 144
its surviving summary
by Proclus, *Odysseus* is killed
unwittingly by his own son “*Telegonus*” 147
who was born by “*Circe*”
in “*Aeaea*” far away from *Ithaca*.
Dying *Odysseus* and *Telegonus* recognize 150

Song 13: *Are other Intelligent Civilizations in the Universe?*

each other, at last. In
repentance, Telegonus buries
Odysseus in *Aeaea*, and marries *Penelope*. 153

The “*Telegony*” ends with
the marriage of Circe with
the Odysseus’s proper son *Telemachus*, 156

born by his wise devoted
wife: Penelope,’ *says the dreamer*.
‘I knew nothing about such an irksome Greek 159
fable about Odysseus’s death.

Even if I have unwittingly
contradicted against such an old Greek mythology, 162

I do not regret that
I’ve invented a brave, pioneering,
and meaningful end of Odysseus, because 165

Song 13: *Are other Intelligent Civilizations in the Universe?*

I believe that he was
a unique human being who toiled
all his life to look deep into the mystery 168
of the human minds,’ *says*
Dante with a firm conviction.
‘Yes, I concur with you, my revered mentor. 171
Your invention of such
a meaningful death of Odysseus
was the very spark of light which inspired me 174
to toil in imagining
an inventive story about Odysseus,’
confesses the meek dreamer in blissful delight. 177

Song 14

*Hymn to
the Sacred Conscience of Human*

Song 14: *Hymn to the Sacred Conscience of Human*

‘I am eager to learn
your invention about *Odysseus*.
Please recite it for me,’ says *Dante with* 3
genuine curiosity and
warm enthusiasm. ‘It is a humble
work of a poor novice. I did not expect 6
that anyone would care to
hear or read it in my lifetime.
I’m overwhelmed, Dante, that you would hear it!’ 9
says the meek dreamer in awe.
‘Go ahead. I am ready,’ says *Dante*
beaming subtle, gentle smiles. ‘It is quite long; 12
I cannot recite it
as a whole.’ ‘Then, just its gist as
you like. It must have taken you for a long time.’ 15

Song 14: *Hymn to the Sacred Conscience of Human*

‘It has been endless struggles
for over three decades,’ *says the dreamer.*
‘I understand. How does it begin to unfold?’ 18
‘It is a fictional
narrative in which the character
“*Homer-Outis*, ” the legendary ancient Greek 21
bard of The Odyssey,
converses with the character
“*Odysseus*” in a numinous dream of the epic 24
poet,’ *says the dreamer.*
‘How did you invent such imaginative
conversations?’ ‘In his mysterious dream, 27
Homer-Outis happens
to meet a strange godlike sage in
a wondrous realm. When the sage asks him who 30

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he is, he confesses that
he is a bard from Ithaca,
a descendant of the godlike hero 33
Odysseus. People call him
“*Homer of Odyssey*” or “*Homer-*
Outis.” At the enthusiastic request by 36
the excited sage, the bard
recites a breathtaking episode from
his Odyssey: the contest of Odysseus’s bow 39
in Book Twenty-One. The bard
notices that the sage is deeply moved
by the episode that he weeps, overwhelmed in 42
ineffable emotions.
The astonished bard prostrates in awe,
and entreats the mysterious sage to reveal 45

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who he is. The sage reveals
that he is the shade of Odysseus,
the real “*Outis—Nobody,*”” *says the dreamer.* 48

‘I like your episode of
the mutual recognition between
the protagonists. How does the story unfold next?’ 51
asks Dante. ‘The bard confesses
that his *Odyssey* was based on vague
confusing ancient legends about Odysseus, 54
passed down by countless minstrels
from the bygone eras. He wishes that
Odysseus check whether his *Odyssey* portrays 57
him correctly or not.

The following episodes present
sincere discussions about *The Odyssey* 60

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between its author *Homer-*
Outis and its protagonist *Odysseus*.’
‘I bet that *Odysseus* confirms the validity 63
of *The Odyssey* in your story,’
says Dante, beaming subtle smiles.
‘Yes, most of it, except his alleged visit 66
of the Hades alive in
Book Eleven of *The Odyssey*,’ *says*
the dreamer. ‘Why did you dare to deny it? 69
The sublime episode of
Odysseus’s discourses with the dead
inspired *Virgil* to write the monumental 72
Book Six of his *Aeneid*,
which in turn encouraged me to sing
the Inferno of my *Commedia*,’ *says Dante* 75

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in stern indignation.

‘*Odysseus* admits that it tells deeply
moving wise stories on the human destiny. 78

Encouraged by their soul-
searching discussions on *The Odyssey*,
Homer-Outis asks *Odysseus* many sincere 81

questions about the enigmatic
story of the “*Trojan War*” as sung
in *The Iliad* by his revered mentor 84

Homer-Meles, known as
Homer of Iliad: the renown
elderly bard of Meles in Smyrna, Asia.’ 87

‘How can you justify
your bold assumption that *The Odyssey*
and *The Iliad* were written by different 90

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authors?’ *interrupts Dante.*

‘It is an essential and crucial
assumption for my fictional narrative 93
as I wished to learn real
human causes of the enigmatic
Trojan War. I confess to you Dante that 96
the deeper I peruse
The Iliad, the more I get confused
what it teaches me to learn. In the next episode, 99
I let the character
Homer-Outis ask the character
Odysseus— who is supposed to have fought 102
throughout the Trojan War—
my own critical questions,’ *says*
the dreamer. ‘I see. You learned the art of 105

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poetry,' says *Dante*.

'In the next episode, *Homer-Outis*
asks *Odysseus* what had caused the Trojan War, 108
and what happened during
its first nine years, which are left unsung
by *Homer-Meles* in his *Iliad*. But *Odysseus* 111
is reluctant to recall
his own agonizing experiences of
the tragic War. Persuasive *Homer-Outis* 114
entreats *Odysseus* to be
his new muse, who would reveal what
have happened after his return to Ithaca 117
so that he may sing a new
proper sequel to his *Odyssey* for
the future humanity. Eventually, *Odysseus* 120

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decides to confide the story
of his eventful life. The following
episodes are narrated by the hero *Odysseus* 123
to his sole audience: *Homer-Outis*.
After the extermination of
the suitors, *Telemachus* summons the Ithacans 126
to an urgent assembly,
and announces the miraculous return
of their long-absent king Odysseus from Troy. 129
Disguised as an alien tramp,
Odysseus reveals himself, at last,
to the astonished Ithacans in awe and wonders. 132
He speaks to them how he came
back home as the sole survivor of
devastating shipwrecks of the whole Ithacan 135

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fleets on the way sailing home
after the sack of Troy. At that time,
he is informed that his old, gravely ill 138
father, King *Laertes* wishes
to see Odysseus before he passes away.
Odysseus and Telemachus adjourn the meeting, 141
and rush to see Laertes
at his farmhouse. The wise hermit
king Laertes advises his dear long-lost son 144
to be aware of the anger
of the slain suitor's families: he
prophesizes that Odysseus must leave Ithaca 147
for his true home: the whole
wide world of humanity to learn
the human nature to the very end. Then, 150

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Laertes passes away in peace.’
‘Despite your bold contradiction to
the final Book Twenty-Four of *The Odyssey*,’ 153
interrupts Dante, ‘I do
appreciate your story: it moves me deeply.’
‘Odysseus abdicates his throne to Telemachus, 156
and retires with his wise
devoted wife Penelope to the small
remote farm left by Laertes. Telemachus learns 159
how to govern people
wisely with honest devotion.
Gradually justice, amity, peace, and prosperity 162
are restored in Ithaca.
He marries *Polycastes*, the youngest
daughter of *Nestor*; she gives birth to a son, 165

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new hope and joy for all
Ithacans. Odysseus recovers
his health and verve, working as a simple 168
farmer with his wise wife.
But, one day, massive fleets of warships
surround Ithaca and threaten to invade 171
by overwhelming armed forces,
organized by the angry families of
the slain suitors for revenge. Odysseus 174
and Telemachus strive to fight,
but wise Penelope tries to avoid
a grim cruel war. She meets with King *Nisus* 177
who leads the hostile armed forces,
and negotiates with the foes for
a peaceful resolution: she succeeds in 180

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persuading them to abide by
a divine verdict to be consulted
at Delphi. The judgment is that the suitors' 183
families must pay to
the estate of Odysseus tenfold
what their sons have plundered. When they fulfil it, 186
then Odysseus must leave
his home for a life-long exile.
Odysseus accepts the verdict as just punishment 189
of his wrong overdoing in
killing all suitors. Wise Penelope
is firmly determined to join with Odysseus 192
for the life-long exile.
In due time, Odysseus and Penelope
leave Ithaca, and sail to visit first Nestor 195

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in *Pylos*. But Odysseus
steers his ship to *Dulichion* first.
He and his wife meet with the families 198
of the suitors, and reconcile
with them in person. Then Odysseus
and Penelope sail across the vast open sea, 201
embarking in deep love
their new exciting, adventurous quests
to learn the mystery of the human nature. 204
The ship of their common
destiny sails through enchanting nights
to greet beauteous dawns with inspiring hopes,' 207
says the elated dreamer.
'It is a poetic ending,' says
Dante. 'It is just the beginning 210

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of my fictional tale,’
says the dreamer. ‘Lead on. I will
follow you to the end,’ *says Dante.* 213
‘The following episodes
unfold imaginary dialogues among
three characters: *Nestor, Odysseus,* and 216
Penelope about the beginning,
the first nine years, and the fall of
the Troy in the final tenth year of the enigmatic 219
Trojan War. These are the very
topics of *The Iliad* and *The Odyssey*
attributed to Homer, and the later, now lost 222
The Epic Cycles, which have
ended in *The Telegony*. In my fiction,
however, some crucial events are invented 225

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to differ radically
from the classical presumptions
on the Trojan War. On his death bed, frail old 228
Nestor tells Odysseus and
Penelope that he did not regard
the “*abduction of Helen by Paris*,” alleged 231
by Agamemnon and Menelaus,
as a serious offence such that
the whole Achaean armies should invade Troad 234
for revenge, and bring back
Helen, despite horrible
miseries and sacrifices of both the Achaean 237
and Trojan innocent peoples.
But Nestor believed that the conquest
of the vast, rich, and fertile Troad would be 240

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the greatest accomplishment
for the whole Achaeans to establish
a new glorious united empire like Egypt. 243

He hoped that the invasion
of Troad would unify the divisive
and competing Achaean chieftains against 246

the common foe, wealthy Troad,
to prevent fatal conflicts among
themselves. When Agamemnon and Menelaus 249

came to entreat Nestor
for his crucial help in persuading
others to join in the War, they swore falsely 252

that they had consulted with
the Delphic oracle on the grave
matter of War: they claimed that the oracle 255

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asserted that Zeus had devised
for Agamemnon to lead the newly
united Achaean armies and to conquer rich Troy, 258
and to bring back Helen
to restore the Achaean pride. When Nestor
asked them for concrete plans for such a formidable 261
war, Agamemnon boasted
that he had visited Troad many times,
and he knew their strength and weakness better 264
than he did about those of
the divisive Achaea. Nestor realized
that Agamemnon had planned for the conquest 267
of Troad long before
the incident of Paris and Helen.
Hence, Nestor decided to persuade other 270

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Achaean chieftains to join in
massive invasion and conquest of Troad,
in the hope of establishing a new great empire 273
of the united Achaeans.

The first nine of the ten-year-long
Trojan War was not a real war but easy 276
brutal piracy of rich,
peaceful, and defenseless Trojan towns
by greedy Achaean forces. Agamemnon proved 279
himself to be an expert
leader for effective piracy, and
the Achaean hosts exulted in their upstart 282
power, wealth, and luxury.

Nestor proposed that they should settle
in the fertile northern Troad and begin to build 285

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the foundation of a new
great Achaean empire. But Agamemnon
strongly rejected the Nestor's prudent advice. 288

After nine-year-long plunders
from the sea, the massive Achaean hosts
depleted once precious resources of the northern 291

Troad. In the tenth year, they moved
south to sack and loot the robust wealthy
city of Troy, protected by its invincible fortresses. 294

The following story is mostly
based on *The Iliad*. But some crucial
episodes are invented in the present fiction, 297

in radical contradiction
to the classical text of *The Iliad*:
When *Penelope* asks how Hector met his death 300

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Nestor recalls what he saw;
Hector had been trapped in a deceptive
ambush by Achilles. At this point Homer- 303
Outis tells Odysseus that
the relevant episode in Book Twenty-Two
of *The Iliad* claims that Achilles killed Hector 306
in a man-to-man duel
with the help of Athena. Odysseus
disproves it as a stupid fib fabricated by minstrels. 309
When Odysseus narrates how
he and his comrades sacked Troy, disguised
as Trojan women released by fleeing Achaean 312
hosts, the surprised Homer-
Outis asks about his alleged strategy
of the colossal wooden horse. Odysseus 315

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denies it as an absurd
inane hoax, conjured up by witless
minstrels. When Penelope asks how King Priam 318
met his death, Nestor tells that
he ended his own life, praying for
resurrection of the fallen Troy, with dignity 321
and noble magnanimity.
King Nestor repents sincerely
his fatal errors in promoting and 324
fighting in the evil
horrible Trojan War and passes away
from his long heroic life in heartfelt remorse,' 327
says the dreamer in awe.
'You made up many bold inventions
which contradicted the authoritative texts 330

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on the Trojan War. Why did
you dare to conjure up such imaginary
episodes?' asks Dante in serious perplexity. 333

'I appreciate your keen
incisive question. *The Iliad*,
and *The Odyssey* inspired me in deep awe 336
and sheer wonders with many
soul-searching questions on the human
nature. For many years I have striven to grasp 339
their possible meanings,
but all in vain. I wished to imagine
the possible human causes of the enigmatic 342
Trojan War: its beginning,
what happened in its first nine years,
and how it ended in its final tenth year, 345

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in terms of human affairs
rather than the mythical attributions
to the conflicting emotions of the Olympian 348
goddesses and gods. To look
into the possible human causes,
I needed to invent certain crucial episodes 351
which seem reasonable
in my fictional story,' *confesses*
the dreamer in earnest. 'Now, I understand. 354
Move ahead in unfolding
your pure imaginations,' *says Dante*.
'The following episodes are invented to 357
solve these puzzles, left unsung
by Homer: Why did Paris venture
from Troy to Achaea? How did he meet 360

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Helen? Why did Menelaus
allow the alleged abduction of
his wife Helen by the strange foreign visitor? 363

If Helen did elope with
Paris to Troy, what were the reasons
which compelled her to take such dangerous, 366
bold, and disgraceful action?

According to “*The Cypria*,” the causes
of the Trojan War are attributed to mythical 369
divine affairs such as
the wedding of *Peleus* and *Thetis*
and the “*Judgement of Paris*” in a beauty contest 372
among *Hera*, *Athena*, and
Aphrodite. The fabulous fable of
The Judgement of Paris has been implicitly 375

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assumed by most classists
to be the cause for the Achaean
invasion of Troy, even though Homer 378
subtly evaded to mention it
in his *Iliad*,’ says the dreamer.
‘I know that you have a natural talent 381
to ask such keen questions.
But did you solve the puzzles in
your imaginations?’ asks Dante with earnest 384
curiosity and enthusiasm.
‘After solemn stately funeral
of King Nestor, *Odysseus* and *Penelope* 387
decide to visit Helen
and Menelaus in Sparta. Due to
dangerous situations, both *Penelope* and 390

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Odysseus are disguised as
male vagrants, escorted by commandos
led by *Pisistratus*, the brave youngest son 393
of Nestor. They sail from
Pylos, and land near *Helos* in secret.
When they creep into Sparta, they find its royal 396
palace burning ablaze.
Dire oppressed people's hatred of
Menelaus erupts in fierce seething violence. 399
An armed man escapes from
the blazing palace, but the mobs of
enraged people catch him. The commandos 402
rescue the man. *Odysseus*
recognizes that he is not Menelaus
but his loyal comrade *Eteoneus*. He tells 405

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that *Menelaus*, *Orestes*, and
Megapenthes were found dead by mutual
slaughter in the palace. When *Penelope* asks 408
about *Helen*, *Eteoneus* says
that she is hiding in the temple
of *Athena*. He guides them to see *Helen* there. 411
At last, *Helen* recognizes
the disguised *Penelope* and *Odysseus*,
visiting her in grave peril. Eventually, 414
Helen decides to confide
her deep secrets to them. She reveals
that *Agamemnon* knew a powerful Trojan 417
noble who helped him meet
King *Priam*. He obtained *Priam*'s consent
to tour coastal towns of northern Troad for trading. 420

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Paris was assigned as the guide
for the Mycenean merchant fleet, led
by Agamemnon. He persuaded *Paris* to visit 423
Mycenae. He held pompous
feasts and festivals in honour of
the handsome prince of Troy. Agamemnon lured 426
Paris to meet a noble
maiden of divine beauty; he guided
Paris to sail to *Helos*, where *Helen* lived. 429
Agamemnon coerced Menelaus
to accept a sly plot: Let *Helen*
seduce Paris, as if she were his maiden 432
sister-in-law, and elope
to Troy with the handsome prince *Paris*.
At first sight, *Helen* and *Paris* fell in love. 435

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Agamemnon left, pretending
he was returning to Mycenae.
Then Menelaus left abruptly for Crete on 438
the excuse of a hoax
funeral of his grandfather with
his faked wife, entrusting *Helen* to entertain 441
their guest *Paris* by herself.
Helen boarded with *Paris* on his ship,
sailing back to Troy. When they reached a remote 444
isle, she confessed to *Paris*
that she was not a pure maiden
but the dejected wife of witless Menelaus, 447
and repented that she had been
trapped to commit her evil deception,
plotted by Agamemnon and Menelaus for 450

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their political ambitions;
They might abuse her elopement
with *Paris* as a pretext for invasion 453
of Troy. Magnanimous *Paris*,
however, embraced *Helen* as
his beloved bride and vowed to protect her 456
forever with true love.
After the astounding revelation,
Helen reminisces her happy blessed new life 459
with *Paris* and his gracious
royal family in Troy, before
the fateful invasion of Troad by Achaean fleets. 462
In agony, *Helen* relates
how the sly powerful Trojan
noble, named *Antenor*, accused her and Paris 465

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as the evil cause for
the Achaean invasion. Antenor
who had lured Agamemnon to attack Troy 468
betrayed his king Priam:
He proclaimed himself as the new king
of the whole Troad, and controlled its most parts 471
except the capital city Troy.
Then, *Helen* recalls crucial events
of the War from the beginning to the fall 474
as she experienced them in Troy.
At this point, the Spartan priestess
of Athena comes in the cell, and informs 477
that *Hermione* was stoned
to death by the angry Spartans.
She urges Queen Helen to flee from the temple 480

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right away to avoid her death
by mad mobs. *Odysseus* and *Penelope*
make bold strategies to protect *Helen*. 483

But *Helen* decides to meet
her death with earnest integrity:
She wants to end her miserable living-death. 486

Helen's only wish is to be
united with her beloved *Paris* in Troy,
even as ashes. *Odysseus* and *Penelope* vow 489

solemnly that they will fulfill
her lofty wish of sublime devout love.

Helen reminisces that she has entrusted 492

her son by *Paris*, named
Ganymede, to the priestess at
Mount Ida, just before the sack of Troy, obeying 495

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the solemn command of
Paris's spirit in her dream. On her way
back to Troy from the Mount Ida soon after 498
the sack of Troy, *Helen* met
angry Trojan women; she was stoned,
and fallen. Eteoneus, who led Menelaus's 501
troop searching for Helen
missing from the Priam's palace,
rescued her to the Menelaus's headquarters. 504
Suddenly, *Helen* takes in
poison to end her eventful life.
She gives her old necklace to *Penelope* 507
as a token to find
her beloved Ganymede, who might
wander astray somewhere in the ruins of Troy. 510

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Soon after the death of
Helen, *Eteoneus* reveals the deep
secrets of *Helen* to the astounded Spartans. 513

They are so deeply moved that
the Spartans acclaim *Eteoneus* as
their new king. To fulfill their solemn vows, 516

Odysseus and *Penelope* sail
to Troy in a Spartan ship, taking
with them the *Helen's* ash in an urn to be 519

united with Paris's ash, and her
necklace to find her son somewhere
in Troad. This is a gist of my story of *Helen*,['] 522
says the dreamer in awe.

'In drastic contradiction to
The Iliad, you have portrayed *Helen* 525

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as a lady of integrity
who upholds her sacred conscience.
But your gist is too vague to appreciate it. 528
Tell me what your characters
speak actually in your *Tragedy*
of Helen,’ says Dante with keen insights. 531
‘Helen [*in tears*]: “O my dear
Penelope and Odysseus! How
valiantly you’ve offered to risk your lives 534
to save me! Your noble
loves have freed me from the inner
prison of wrongly accused wanton ‘Helen.’ 537
How happy I am to end
this dreadful living-death, which I’ve been
suffering since Troy’s ill-fated fall.” [*Suddenly* 540

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*Helen takes out a vial
of potent poison from her belt,
and drinks it]. Penelope [crying in anguish]:* 543
 “Ah, Helen! What have you done?”
Helen: *“I feel so happy and
peaceful to die in your warm, kind bosom.”* 546
 Odysseus [*kneeling humbly*]:
 *“Oh, Helen, forgive me! How wrongly
I used to blame you for our woes and miseries.* 549
 *You are, indeed, a true
daughter of Zeus; Now, I see
the gracious and gentle nobility of* 552
 your sublime virtuous spirit!”
Helen: *“I don’t trust the boastful
Tyndareus’s claim that Zeus loved Leda,* 555

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*and begot me. If I were
his daughter, why would Zeus have
tormented me with such dire agonies and vile 558
shames? I'm, but a simple
woman who has devoted to love,
and hopes to be loved by a true, pure heart.” 561*

*Penelope: “Oh, Helen,
be our merciful goddess, guiding us
to reach our true home of righteousness in peace.” 564*

*Helen: “Farewell, my dear
resourceful Odysseus! In you,
I see the complete man! My beloved cousin 567*

*Penelope! In you, I see
the perfect woman! May you bring
the light of truth and peace to this world.” 570*

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Helen [*in a sudden
ecstatic exultation*]:
“O, you’ve come, my Paris, to lead me from 573
 this harsh, vile world to
the eternal realm of our true love!”
Thus whispering, Helen is rapt in a trance, 576
 then she passes away in peace,
says the dreamer, trembling in awe.
Dante muses immersed in a deep meditation. 579
 At last, he breaks eloquent
silence: ‘It is a deeply moving
drama on the mystery of Helen. I hope 582
 that you unfold the next
epic on *Odysseus* and *Penelope*,
fulfilling in Troy their solemn vows to Helen.’ 585

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‘*Odysseus and Penelope*
sail first to Crete, and visit King
Idomeneus. When he learns what *Helen* has 588
revealed at her tragic death,
Idomeneus laments: “*O gracious*
noble Helen, my eternal beloved! How 591
unjustly you’ve suffered
ineffable miseries in this vile,
horrible world. May your father Zeus 594
redeem you to enjoy
a timeless blissful after-life. It must
be jealous Hera who tormented you so 597
cruelly via her vile villain,
Agamemnon— the very cause of all
our terrible woes. It rends my heart that 600

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such a vile sly crook
had so utterly deceived us.
How much I regret that I could not avenge you!” 603
When *Penelope* tells him
that young *Helen* admired him the most
among her many gallant suitors before her father 606
chose *Menelaus* for her,
Idomeneus says in exaltation:
“*I am deeply moved to learn it, at last,* 609
even if it is too, too late!
Menelaus came here with Helen
after he lost all his fleets and booty taken 612
from Troy. It broke my heart
to see Helen in such tattered rags.
Yet, despite her miserable sufferings 615

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*of ineffable agonies
and miseries, she kept her gracious
noble poise in peace: the aged Helen looked 618
to be far more beauteous
and mysterious than the young Helen
who had enthralled me in the bloom of her youth. 621
I informed King Tyndareus
of the unexpected arrival of Helen
with Menelaus and I would escort them 624
to Helos aboard my ship.
It was the most moving encounter
that will remain forever in my cherished 627
memory: frail old father
embracing his much suffered
loving daughter in tears of joys. Old King 630*

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Tyndareus and Menelaus
came and thanked me for what I did,
and invited me to join with them in a festival 633
of thanksgiving to the gods
for their safe return to be held
in Sparta. But I declined it politely 636
as I had to return
to Crete to subdue on-going revolts.
Then beautiful Helen came to see me alone; 639
Humbly she knelt at my feet,
thanking me deep from her noble
warm heart. Trembling in awe, I raised her 642
and gently embraced her—
it was the first and the last embrace
of my eternal beloved!” “You have created 645

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a moving story of restrained,
noble, and deep love of *Idomeneus*
and *Helen*. It touches my heart,' says *Dante*. 648

‘After the memorable
visit of King Idomeneus in Crete,
Odysseus and *Penelope* resume their voyage 651
to Troy. Amid the vast sea
their ship is suddenly surrounded by
massive fleets of warships. They are from Argos, 654
commanded by *Diomedes*
on the way to conquest Italy
to found their new kingdom. *Odysseus* meets 657
his dear old brother-in-arms:
They share what happened in their eventful
lives: Betrayed by his wife while he fought in Troy, 660

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Diomedes decided to leave
Argos for a new life in Italy.
Diomedes apologizes to *Penelope*: 663
 “*Revered paragon of virtue,*
gracious Queen Penelope, please forgive
our unwitting intrusion. May you achieve 666
 your noble bold mission
for the vindicated Helen.” *Penelope*
replies: “Son of Tydeus, valiant epigoni 669
 Diomedes! I respect your lofty
ideal and integrity as our righteous
brother-in-arms. May you found a great new 672
 nation for prosperity,
and creativity of humanity in peace.”
‘Are you inventing another *Aeneid* ?’ asks 675

Song 14: *Hymn to the Sacred Conscience of Human*

Dante. 'No. The episode
of Diomedes ends with the departure
of his fleets for Italy. Then the Spartan 678
crews revolt against *Odysseus*
in bold mutiny; they abandon
Odysseus and *Penelope* on a small remote isle. 681
They sustain primitive life
free from the evils of human societies.
But pirates seize them to *Chios*, and sell them 684
as slaves: *Odysseus* is sold first
to serve King *Amphion* of *Thebe* whereas
Penelope is sold to serve *Chryseis*, the priestess 687
of *Chryse*. One day, *Chryseis*
comes to *Thebe* to celebrate the feast
of harvest. She detects the real identity 690

Song 14: *Hymn to the Sacred Conscience of Human*

of concealed slave-*Odysseus*.
She buys him from Amphion, and brings
him with her to Chryse.’ ‘Is this character 693
the same woman, the captive
of Agamemnon who boasted that
she had excelled his wife *Clytemnestra* 696
in beauty, intelligence
and ability?’ asks *Dante*. ‘Yes,
the very same lady whom *Odysseus* escorted 699
to return to her father,
the priest who pleaded Agamemnon
to release her for ransom,’ says *the dreamer*. 702
‘I see. Please unfold her story.’
‘Merciful *Chryseis* reunites *Odysseus*
and *Penelope* at her temple, and provides 705

Song 14: *Hymn to the Sacred Conscience of Human*

the crucial help for them
to carry out their formidable missions
in Troy. At last, her ship conveys *Odysseus* 708
and *Penelope* to Troy.
He pitches a tent on the desolate
ruins of his old headquarters. Awful memories 711
of vile, gory, and ghastly
events keep *Odysseus* sleepless
in dire bitter anguishes, while *Penelope* falls 714
sound asleep in her first night
on the foreign soil of fateful Troy.
Odysseus is thrown into horrible nightmares. 717
She wakes and comforts him.
Shivering in eerily chills, *Odysseus*
tries to make a campfire nearby. Suddenly 720

Song 14: *Hymn to the Sacred Conscience of Human*

a snake bites him, and he falls
unconscious. A passing shepherd
carries him on his back to his home so that 723
his mother would rescue
mortally poisoned *Odysseus*.
When *Odysseus* regains his sense, at last, 726
he recognizes that his rescuer
is the son of *Ajax*, named *Telamon*,
and his mother is the Trojan princess, called 729
Tecmessa. *Penelope* and
Odysseus stay with the *Ajaxes* as if
they are a faithful one caring family 732
in awful accidents of life.
Chryseis visits with a good doctor
who treats *Odysseus* with expert medical skills.’ 735

Song 14: *Hymn to the Sacred Conscience of Human*

‘It is a good plot that
Odysseus obtained such needed helps from
his Trojan friends, but how could he carry out 738
the unfeasible task of
uniting *Helen* with Paris, even
as ashes?’ *asks Dante*. ‘It is done by 741
Helenus, in my fiction,’
says the dreamer. ‘By *Helenus*?
Do you mean the Trojan seer, the brother 744
of *Hector*?’ *asks Dante*
in perplexity. ‘Yes!’ ‘Explain to me
how he did it, and why,’ *demands Dante*. 747
‘After long painstaking
preparations, they creep inside
the devastated city of Troy via a dark 750

Song 14: *Hymn to the Sacred Conscience of Human*

hidden underground passage:
Odysseus is disguised as an old
Trojan woman; *Penelope* carries the urn 753
of Helen's ash with her;
Tecmessa takes seedlings to adorn
the tombs of Priam, Hector, and Paris. 756
Telamon is ready to guard them
with his sword, presented to Ajax
by Hector after their man-to-man duel. 759
In sincere respect, they clear
rampant weeds from the deserted tombs.
Penelope kneels to pay her heartfelt 762
homage to Hector—her revered
paragon of courage and virtue.
She plants an oak tree as a proper symbol 765

Song 14: *Hymn to the Sacred Conscience of Human*

for Hector. *Odysseus* begins
to dig the tomb of Paris in uniting
Helen's ash with that of Paris in love. 768

Suddenly a stern voice
roared: "*Stop it, right now! Who are you?*
Why do you dare to defile the tomb of noble 771
prince Paris?" A kingly man
commands his soldiers to seize *Odysseus*.
"*I am Queen Helen's servant from Sparta,*" 774
says he in dire dismay,
"*I came here to fulfil her last will:*
She bade me to bury her ash with her beloved 777
husband, Paris." "Ah, you
cunning Odysseus in disguise!
Do not try to deceive Helenus. Confess 780

Song 14: *Hymn to the Sacred Conscience of Human*

*your real purpose, lest you
will be punished by instant death.”*

Thus speaking Helenus threatens to cut off 783

*Odysseus’s head. “Please do not
harm him!”* cries out brave Tecmessa,

*“He is an honest pilgrim: Repenting his past
wrongs, he came to Troy*

to promote peace.” “What? Who are you?”

asks Helenus looking at Tecmessa, pleading 789
earnestly at his knee.

Suddenly agile *Telamon* lunges

Helenus from behind and threatens 792

to kill him with his sword:

“Swear to gods that you will set

Odysseus free, or I will kill you, right away,” 795

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shouts *Telamon*. “Tell me, first,
who you are, and why you dare to
rescue him,” says *Helenus* in a dignified poise. 798

“I am *Telamon*, the son
of Great *Ajax*. Behold that I hold
this famous sword that *Hector* presented to 801
my father after their heroic

duel!” At that moment, an arrow
hits *Telamon*’s right arm: in acute pain 804

he drops his sword. The nimble
archer snatches the sword from the ground,
and wields it to kill bleeding *Telamon*. “Stop!” 807

roars *Odysseus*, “Do not
abuse that sword of noble *Hector*
in murdering this valiant son of *Ajax*: 810

Song 14: Hymn to the Sacred Conscience of Human

*Let him live and prosper
so that he can join with you in
rebuilding a new great Troy. If you must, 813
plunge the sword into my heart.”*

The stunned archer surrenders the sword
to *Helenus*. At that time, *Andromache* appears 816
with her attendants. “My lord,
why do you threaten to kill this poor
Trojan woman? Who is she? What misdeed 819
did she commit?” asks
Andromache in warm, gentle voice.
“This is not a Trojan woman but our most 822
evil and dangerous foe—
Odysseus, in shrewd disguise!” says
Helenus. “Who? *Odysseus*? Why did he 825

Song 14: *Hymn to the Sacred Conscience of Human*

come back to this ruin of Troy?”
asks *Andromache* in shock of
bewilderment. “*According to him, Helen* 828
at her death asked him to unite
her ash with that of Paris in Troy.
But who can ever trust what wily Odysseus says?” 831
Thus saying *Helenus*
orders his soldiers to bind *Odysseus*
in chains and to get ready to hale him to 834
their fleet moored at the port.
“*Who are these bleeding young man and*
poor weeping woman holding him?” asks 837
Andromache pointing to
Telamon and *Tecmessa*. “*Oh gracious*
Andromache, do you remember Tecmessa? 840

Song 14: Hymn to the Sacred Conscience of Human

*Please save my son from grave
indignation of King Helenus!"*

pleads *Tecmessa*. "My dear cousin *Tecmessa*!" 843

*What a surprise to see you
here after so many awful years!"*
exclaims *Andromache*, gently embracing her. 846

*"That reckless rash rascal
dared to kill me," said Helenus,
"in bold defence of Odysseus with this sword* 849
that Hector gave to his father,

*Ajax." "He is bleeding with an arrow
pierced in his arm. Let us send him to our ship* 852
to be treated as quickly as

*possible. He looks a courageous,
noble young man. I wish that the new generations* 855

Song 14: *Hymn to the Sacred Conscience of Human*

*descended from the noble
blood of both Trojan and Achaean
heroes achieve everlasting peace.” Thus* 858
*speaking Andromache bids
her attendants to bring Telamon
and Tecmessa to their ship. Hand in hand* 861
*Andromache and Helenus
stroll happily, viewing the tombs
of Hector and Priam. A serene sunset* 864
*suffuses the place in peaceful
tranquillity. “Let us return to our ships
with our most prized captive,” says Helenus* 867
*exalted in triumphant delights,
“and celebrate this glorious and
victorious day!” All soldiers and attendants* 870

Song 14: *Hymn to the Sacred Conscience of Human*

respond with good cheers.

“Who did plant the oak at Hector’s tomb?”

asks *Andromache* in surprise. *“I did it,”* says 873

Penelope in humility.

“Who are you? Why did you plant it,

stranger?” “A humble yet heartfelt homage 876

to the most valiant, virtuous,

and noble hero of Troy from

a meek Achaean woman, the poor wife 879

of Odysseus.” “What do I hear?

Then you must be that paragon of

virtue, Queen Penelope of Achaea!” 882

exclaims *Andromache* in

astonishment. *“I am that Odysseus’s*

guilty wife who enticed him to take on 885

Song 14: Hymn to the Sacred Conscience of Human

our bold and hard adventures
far away from our home in Ithaca,
astray beyond our horizon,” confesses 888
Penelope in tears.
“Please set free Odysseus back to me!”
pleads Penelope, begging for mercy 891
to adamant Helenus,
“he came back to Troy as a humble
pilgrim to repent the horrible misdeeds 894
of the wrong Achaean hosts,
misled by cunning evil Agamemnon.”
But indifferent Helenus keeps a chilly silence. 897
“Why did you risk your life,”
asks Andromache in gentle tone,
“to visit this hostile land of Troy, brave 900

Song 14: Hymn to the Sacred Conscience of Human

*Queen Penelope? What do
you keep in that urn, embraced in
your bosom?” “This holds the ash of my dear cousin 903
Helen:” says Penelope,
“When we visited her at her death
in Sparta, Helen confided to us her shocking 906
incredible secret truth
that she had been such a helpless
wretched victim of the evil intrigues, 909
cunningly plotted by the vile
Agamemnon and cowardly Menelaus
to conquer and plunder rich fertile Troad. 912
Helen’s last wish was to be
reunited with her beloved husband
Paris, even as ashes, in Troy. Odysseus 915*

Song 14: Hymn to the Sacred Conscience of Human

*and I pledged Helen that
we shall fulfil her wish, taking
solemn oaths to gods. Please permit us to 918
unite Helen's ash with that
of Paris to achieve her lofty will
of faithful, eternal love!" "O my dear 921
sister Helen!" weeps gracious
Andromache, cuddling tenderly
the urn in her bosom, "I know too well 924
how much you have suffered
in this vicious world of evils!
May you rest in blissful peace. My dear lord 927
Helenus, let me honour
the noble spirit of Helen by
uniting this with that of her beloved 930*

Song 14: Hymn to the Sacred Conscience of Human

*husband, Paris.” “I am
deeply moved by noble Helen’s
last wish to be rejoined with her beloved Paris 933
in Troy—even as ashes.
But how can we trust that what wily
Odysseus claims to be true? How can you prove, 936
Queen Penelope, that this urn
contains the ash of real Helen,
not a fraud?” says Helenus in stern stance. 939
“Penelope cannot speak
a fraud!” says she in solemnity,
“Do you recognize this necklace?” Penelope 942
takes it off from her neck,
and shows it to Andromache.
“This is Helen’s! It reminds me of our 945*

Song 14: *Hymn to the Sacred Conscience of Human*

*cherished happy days when
she was knitting it in my chamber
while her son was playing with my baby,* 948
*Astyanax;” says Andromache
in a pleasant surprise, “I wonder
how you have obtained her private necklace.”* 951
*“Helen entrusted it to me
as a token to find her son by Paris—
called Ganymede—before she ended her own* 954
*tragic life: Odysseus and
I vowed solemnly to Helen
that we should look for her son wandering* 957
*in the ruins of Troad,” says
Penelope. Then Helenus speaks
in a sombre grave voice: “According to what* 960

Song 14: Hymn to the Sacred Conscience of Human

*I have heard, Ganymede was
strangled to death by vile Menelaus
when he found the son of Paris, cuddled in 963
the bosom of Helen.*

*If this is a false fib, please tell me
what had really happened.” “Helen told us 966
that she had entrusted
Ganymede to the priestess of Apollo
at Mount Ida just before the demise of Troy,” 969
says Penelope in poise.*

*“Did Helen tell you, Queen Penelope,
why she had carried out such a bold and 972
heartbreaking sacrifice
of her beloved son?” asks Andromache.*

“The night after the Achaean host withdrew 975

Song 14: *Hymn to the Sacred Conscience of Human*

*from the beachfront of Troy,
the spirit of Paris came to Helen
in her dream and forewarned the fatal fall* 978
*of Troy. Solemnly, he bade
Helen to rescue their only heir,
Ganymede, by entrusting him in strict secret* 981
*to the priestess of Apollo
in Mount Ida. Helen obeyed
her husband's behest. She won the sympathy* 984
*of the priestess who vowed
to bring up Ganymede in Mount Ida,
as if he were her child in a resolute secret.* 987
*I presume that Helen
gave her as a token another
necklace with the identical pattern* 990

Song 14: Hymn to the Sacred Conscience of Human

as this one,” says Penelope.
“Now it dawns to me in a clear light
why Helen disappeared from us so suddenly 993
just before the fall of Troy;”
says Andromache in a great relief,
“Cassandra accused that Helen had betrayed us, 996
joining with the Achaean
host, and aided them to destroy Troy
into ruins as condemned by Hera and 999
Athena to punish Paris
for his wrong judgement.” “I avow that
Cassandra made absurd false accusations 1002
not only of honest Helen
but also of our holy goddesses,
Hera and Athena;” says Penelope in terse 1005

Song 14: Hymn to the Sacred Conscience of Human

indignation, *“When the fatal*
news of Troy’s demise reached the remote
shrine in Mount Ida, Helen rushed to return 1008
to Troy. On her way she met
with fleeing Trojan women; when they
recognized who she was, they began to stone 1011
her in rage. Stones hit her head;
Helen fell, bleeding, and swooned.
When she regained her sense, Helen found herself 1014
by weeping Menelaus
in anguish of remorse. He told her
how his soldiers rescued her from bleeding 1017
to death; how happy he was
to see his noble wife again alive.
But Helen spoke to him that she wanted to die 1020

Song 14: *Hymn to the Sacred Conscience of Human*

rather than to suffer
as his prisoner. At this point
Agamemnon intruded in, and demanded to yield 1023
Helen, under his custody
for a public trial of her wanton
misdeeds. Enraged Menelaus drew out his sword, 1026
swearing that he would protect
his noble wife from evil Agamemnon.”
“O our noble gracious faithful Helen!” 1029
interrupts Helenus
deeply moved in tears, “you came back
home for us to honour you with heartfelt love!” 1032
He embraces the urn of
Helen’s ash, and speaks in a sincere
voice: “Please forgive me for my rude suspicion, 1035

Song 14: *Hymn to the Sacred Conscience of Human*

*Queen Penelope. You have
achieved this miraculous revival
of the lofty, noble spirit of Helen to live on* 1038
*deep in our loving hearts
forever!” Gently he hands the urn
back to Andromache, picks up the shovel,* 1041
*left by Odysseus and
finishes digging to reunite
Helen with Paris in lofty spirit. The afterglow* 1044
*of glorious sunset fades,
and calm dusk gently descends on Earth.
The soldiers light torchlights. Andromache and* 1047
*Penelope kneel in prayer;
Helenus buries the urn of Helen’s
ash into the Paris’s tomb, while they watch* 1050

Song 14: *Hymn to the Sacred Conscience of Human*

the symbolic reunion
of Helen with Paris, lit by blazing
torchlights, all overwhelmed in awe and wonder.’ 1053

*Here falls the dreamer in
deep trance. Unwittingly, Dante kneels
as if he were witnessing the pious action
of the sublime, sacred,
human conscience rapt in deep awe.*

At last, Dante breaks the eloquent silence: 1059

‘How would you bring your deeply
moving epic to its conclusion,
exalting the sacred conscience of mortal 1062

human characters you have
created in your lush imaginations?’
‘I have been earnestly searching for a meaningful 1065

Song 14: *Hymn to the Sacred Conscience of Human*

conclusion. The following
ideas are provisional sketches for it:
Odysseus and *Penelope* are brought as 1068
momentous captives to
Helenus's maritime kingdom centred
at Samos. *Odysseus* is imprisoned in a harsh 1071
dungeon; he is set to face
a grave trial for his misdeeds in
the Trojan War. *Penelope* is put to serve 1074
Queen Andromache.
But they become faithful friends with deep
mutual trust and respect. *Andromache* confides 1077
her miserable past: how
brutally Neoptolemus murdered
her infant son by Hector, and abused her 1080

Song 14: *Hymn to the Sacred Conscience of Human*

as his slave in Phithia.

When Orestes murdered Neoptolemus
during his visit of Delphi, old king Peleus 1083

fell gravely ill in anguishes
and utter despairs. With devotion
Andromache nursed and comforted Peleus. 1086

Peleus granted her freedom
to return to Troy. Her ship
met sudden tempests near Lemnos. She was 1089
rescued by *Helenus*,

who happened to sail nearby. It was
a miraculous accident which united them 1092

in deep love. As for the trial
of *Odysseus*, it turns out to be
the private confessional conversations 1095

Song 14: Hymn to the Sacred Conscience of Human

between the wise seer,
King *Helenus*, and his dispirited
captive, *Odysseus*: “*Let us converse as man* 1098
to man in earnest. Trojan
elders urge me to punish you
by death for your grave war crimes. Now, tell me 1101
the truth: why did you come
back to dangerous ruins of Troy
with your noble wife, audacious Odysseus?” 1104
“*My new ill fate forced me*
to take harsh life-long exile from
my beloved Ithaca, to which I returned 1107
after twenty years of dire
struggles. My faithful wife decided
to join with me in endless wanderings. 1110

Song 14: Hymn to the Sacred Conscience of Human

*Her brave, prudent wisdom
and sincere devotion have brought
forth miraculous changes from the harsh exile 1113
to a meaningful new life
for us to learn the profound mystery
of humans' mind." "Pursuing the mystery 1116
of the mind? You sound like
a mystic seer," says Helenus,
"rather than the valiant warrior with 1119
resourceful mind that brings
forth brilliant tactics to demise
his foes. What did you find out about the mind 1122
through your hard wanderings?"
"I learnt that it was beyond my wits
and ken," says Odysseus in an honest humility. 1125*

Song 14: Hymn to the Sacred Conscience of Human

*“What concrete events that
you had experienced did convince
you to realize the private truth?” asks Helenus.* 1128

*“Helen’s revelation of
evil Agamemnon’s sly plots for
the wrong cruel War struck me as if death blows.* 1131

*I was shocked to realize
that I had been utterly deceived
into ruining myself, my home, my country* 1134

*as well as Troy, in vile
vainglory. I lost the very reason
of my being,” confesses Odysseus in remorse.* 1137

*“Why did you risk the life
of your noble wife and your self
to bring Helen’s ash to Troy, overcoming* 1140

Song 14: Hymn to the Sacred Conscience of Human

*countless grave dangers and
bitter hardships?” asks Helenus.
“Penelope and I pledged Helen,” says Odysseus, 1143
“to fulfil her noble wish
to be joined with her beloved Paris
even as ashes. Our mission in Troy ended 1146
as your captives. I’m ready
to die for my cruel misdeeds
to the Trojans. My last wish, I plead you 1149
King Helenus, is that
you grant my upright wife freedom
to return safely to her home in Ithaca.” 1152
“You came back to Troy as
a bold free man, Odysseus, who
dared to carry out the noble hard task. 1155*

Song 14: Hymn to the Sacred Conscience of Human

*Killing such a man can't
bring a single dead Trojan back
to life nor help us rebuilding new Troy:* 1158
*Such rash cowardly acts
will offend the gods and make us
as base and evil as the Achaeans,"* 1161
says stately Helenus.
*"Your generous spirit soothes
my pangs of pain, agony, shame, and regret,"* 1164
*says Odysseus. "What do you
regret with shame?" asks Helenus.*
"I was blind to defeat the Trojans by any 1167
*means, without thinking who
were righteous or evil. Do you
resent Helen for the wrong War?" asks Odysseus.* 1170

Song 14: Hymn to the Sacred Conscience of Human

“No! She was the poor prey,”
says Helenus, “for the vicious
pretext, used as effective propaganda 1173
by wily Agamemnon.

In fact, Helen’s honest warning
of the Achaean invasion of the Troad 1176
alerted us to prepare

for it, but our wily treacherous
Antenor betrayed us to ignored it 1179
as if it were her sly
deception to cover up her shame.”

“Helen told us that Antenor was your 1182
vile insidious traitor

who proclaimed himself as a new
emperor of Troad, when we had invaded 1185

Song 14: *Hymn to the Sacred Conscience of Human*

the northern shores of Troad.
If so, please tell me more about this
enigmatic man—Antenor,” says Odysseus 1188
in deep perplexity.
“Antenor was a bright man from
a noble family in Troy. King Priam helped him 1191
to study at the renowned
school of erudite scribes in Babylon.
He excelled in learning new technological 1194
knowledge as well as writing
in Akkadian and Hittite languages.
He was appointed as a scribe at the court 1197
of the Hittite empire
in Hattusa. There he married
a Hittite princess and became a trusty 1200

Song 14: Hymn to the Sacred Conscience of Human

envoy of the Emperor.

As his envoy, Antenor visited

many cities in Achaea and Italia

1203

for diplomatic missions:

I presume that he got acquainted with

Agamemnon during his visits to Mycenae.

1206

Many years later, Antenor

moved back to Troy as an avid

counsellor to King Priam. He became

1209

the influential leader

of chieftains in the northeastern

regions of Troad,” says Helenus in dismay.

1212

“Helen told us that he

had invited Agamemnon to visit

Troy many times, and arranged Paris to guide

1215

Song 14: *Hymn to the Sacred Conscience of Human*

*his fleets for extensive
tours of Troad. If so, I surmise
that competent and ambitious Antenor* 1218
*might have been the crucial
mastermind who manipulated
Agamemnon to invade Troy,” says Odysseus* 1221
*in a surprised recognition.
“You made keen inferences, insightful
Odysseus! Antenor’s strategies were quite* 1224
*brilliant and foresighted,”
says the wise seer Helenus.
“Please expound them for me so that I can* 1227
*appreciate the competent mind
of enigmatic Antenor,” says Odysseus.
“His strategy to brainwash Agamemnon* 1230

Song 14: Hymn to the Sacred Conscience of Human

to invade rich Troad was
masterful: when his guest finished
his extensive tours of Troad, guided by Paris, 1233
Antenor told Agamemnon
that Troy had been doomed to be sacked
by a foreign invader: both Hera and 1236
Athena intended to
bring down its fatal demise as
their punishments of Paris's insult to them, 1239
because he had dared
to judge that Aphrodite to be
the most beautiful among the three goddesses. 1242
Antenor urged Agamemnon
to invite handsome attractive
Paris to visit Mycenae and let him 1245

Song 14: Hymn to the Sacred Conscience of Human

*entice a noble and
beauteous Achaean lady
who would elope with him to Troy. Antenor* 1248
*convinced Agamemnon that
he was chosen by Hera and
Athena to form and lead strong Achaean* 1251
*forces to carry out such
a glorious task,” says Helenus
in a sombre mood. “Now I see that reckless* 1254
*ambitious Agamemnon
followed blindly the fatal course
of the awful War, obeying to cunning* 1257
*wily Antenor. Helen
told us how she had been misled
to fall into his cunning trap and how* 1260

Song 14: *Hymn to the Sacred Conscience of Human*

inadvertently Paris
fulfilled the Antenor's crucial scheme
by bringing Helen to Troy!" says Odysseus 1263
in pangs of deep regrets.
"Soon after Helen came to Troy
with Paris," says Helenus, "Antenor 1266
conjured up the glib hoax
folktale, so-called, "The Judgement
of Paris on the Beauty of Three Goddesses." 1269
It sounded like an absurd
naive fib, but it had powerful
effects on the credulous Achaeans 1272
as well as the Trojans:
They were misled to believe that
Troy had been condemned to perish by Hera 1275

Song 14: Hymn to the Sacred Conscience of Human

*and Athena due to
the alleged insult of Paris
to them. Prompt Antenor sent his minstrel 1278
to Agamemnon so that
his hoax folktale would be rapidly
dispersed among the whole Achaeans by many 1281
minstrels of Agamemnon.
When the hoax folktale reached back to
Troy eventually by wandering minstrels, 1284
our fanatic Casandra
inflicted devastating harms to
her own people: her delusive belief 1287
in the wily hoax folktale
and the falsely accused “Abduction
of Helen by Paris” misled an over- 1290*

Song 14: Hymn to the Sacred Conscience of Human

*whelming majority of
the Trojan people to believe
as if we were guilty and thus deserved 1293
revenge by the righteous
Achaeans. Hence, crazy Cassandra's
fanatic promotion of Agamemnon's false 1296
yet lethal pretext for
the War poisoned and disheartened
the hearts of our superstitious people," 1299
says Helenus in anguish.
"Now, I realize the incredible
effects of Antenor's and Agamemnon's hoaxes. 1302
Helen also told us how
slyly Antenor conspired with
Agamemnon and crushed Paris's crucial plans 1305*

Song 14: Hymn to the Sacred Conscience of Human

*to build up a strong Trojan
navy to defeat our fleets at sea
before we could invade Troad,” says Odysseus. 1308*

*“Yes, Antenor made us
helpless victims of your shameful
piracy as you had a complete control 1311*

*of our seaways due to
our lack of strong naval forces,” says
Helenus in dismay. “I concur with you 1314*

*that the Antenor’s strategies
were ingenious: He lured Agamemnon
to attack strong Troy, and gambled to achieve 1317*

*his ambition to rule
over the Troad. But didn’t his empire
fail, despite the demise of Troy? If so, 1320*

Song 14: Hymn to the Sacred Conscience of Human

*what happened to him?” asks
Odysseus. “Antenor worked very hard
to build up promptly his new navy at Abydos. 1323
He appointed his son Agenor
as its commander, urging that
when he would have obtained the mighty armada 1326
of a thousand warships,
they should conquer the Achaeans,
and then the Italians in the West. But ambitious 1329
Antenor died suddenly,
presumably of a heart attack.
His new empire of Troad dissolved quickly 1332
as the chieftains revolted
to restore their sovereign powers.
Eventually, Agenor joined with me, bringing 1335*

Song 14: Hymn to the Sacred Conscience of Human

*his new fleet of two hundred
warships from Abydos to Samos.*
Brave Agenor urged that we should destroy 1338
*the Achaean ships moored on
the beach-front of Troy and wipe out
the Achaean invaders. Then we should sail* 1341
*to and attack their homelands,
left vulnerable, and conquer them,”*
says Helenus in great excitement. “That was 1344
an ingenious strategy!
*Some gods must have saved us by
preventing you from carrying out such fatal* 1347
attacks at our back,” says
Odysseus in renewed terrors. “It was
you, Odysseus, who played such a god: while we 1350

Song 14: Hymn to the Sacred Conscience of Human

*were preparing for the ambush
from your back, you sacked Troy just
ahead of us with your effective lethal ploy.* 1353

*You defeated us with your
superior wits and guts. But why
did you destroy Troy into such utter ruins?”* 1356

*says Helenus in stern
indignation. “I learned later
in dismay that Agamemnon had incited* 1359
such reckless awful misdeeds.

*The real purpose of our invasion
was to expand our narrow territories* 1362
to the vast realm of Troad.

*Nestor and I hoped that we would
govern well the native Trojans as well as* 1365

Song 14: Hymn to the Sacred Conscience of Human

*newly immigrated Achaeans
in peaceful cohabitation and
prosperity. Such a hope of my ideal* 1368
*perished with Troy into
utter ruins by awful madness
of the cruel, brutal War,” confesses Odysseus* 1371
in pangs of agonies.
*“All things change, obeying the laws
of Fate: When a state suffers insidious* 1374
*intrigues, a stronger state
conquers the weak in due time.*
The fatal fall of once splendid Troy taught me,” 1377
*says Helenus, “not to attempt
to rebuild it from its desolate ruins
but over the vast open sea, embracing* 1380

Song 14: Hymn to the Sacred Conscience of Human

*diverse peoples to
establish a new great civilization
for the whole humanity,” speaks Helenus with* 1383
resolute determination.

*“The moment I saw your new kingdom,
I felt your insightful foresight,” says Odysseus.* 1386

*The wise seer-king speaks
in deep thoughts: “It is only a dream,
now. We need many good peoples to work with* 1389
*to realize it to come
to be true. If you and your wife
are set free, what do you want to do next* 1392
*in audacious adventures
of your fascinating life?” asks
Helenus with a thoughtful and sincere voice.* 1395

Song 14: *Hymn to the Sacred Conscience of Human*

His unexpected question
strikes *Odysseus* speechless at a loss.
“*I feel that I have reached the very end* 1398
of my futile blind life:
I do not know where to go from here—
this may be my destined harbour to embark 1401
for the dark mystic realm
from which none ever returns,” confesses
Odysseus. For a long while, *Helenus* immerses 1404
himself in meditation;
Then he begins to inscribe strange scripts
on large papyrus sheets. When he finishes writing, 1407
he speaks to *Odysseus*:
“*I send you to see a wise man,*
called Aethon, at the shrine aloft Mount Ida. 1410

Song 14: Hymn to the Sacred Conscience of Human

*Hand over him this letter
in person and wait for his response.
Converse with him about your life in honesty 1413
with reverence. My soldiers
will guide you climbing up Mount Ida.
Farewell, Odysseus. I hope that you will find 1416
a light to your renewed life
with holy Aethon!” Odysseus kneels
humbly to receive his letter and speaks in awe: 1419
“Compassionate seer
Helenus, you bless to save the lost
soul of your worst foe in the past. I will 1422
obey to your insightful
behest with all my heart and soul.”
This is what I have sketched so far. How Odysseus 1425*

Song 14: *Hymn to the Sacred Conscience of Human*

will pursue his new life
as a hermit through spiritual
inner journey into his own sacred

1428

conscience is a task that
I wish to fulfil ere I perish,'
says the dreamer in a heartfelt prayer.

1431

Song 15

*Dante's Advices to
the Dreamer at Farewell*

Song 15: *Dante's Advices at Farewell*

*After a profound
contemplation, Dante speaks:*

‘Your apt invention of the “*Episode of
Helenus*” is ingenious. 3

It makes a good sense in your search
for possible human causes of the Trojan War. 6

But I have grave questions
for you to answer.’ ‘I will try
my best to reply whatever you ask,’ 9

says the dreamer. ‘For whom
have you struggled to write your bold
and imaginative ideas?’ *asks Dante solemnly.* 12

*The meek dreamer becomes
speechless.* ‘I presume that you will
write down what we have discussed in this strange 15

Song 15: *Dante's Advices at Farewell*

encounter. Who, do you
hope, will read your works of art?’
asks Dante. ‘I am determined to fulfil 18
my private sacred vow
to write down what we have conversed.
But I do not know who would care to read 21
what I write; perhaps, I am
a lone sole reader of my work,’
mumbles the dreamer in honest humility. 24
‘Even if we cannot know
the readers of our works in the future,
we always hope that there will be as many 27
unknown friends who would
appreciate our works over as long
era as it may be possible in this world, 30

Song 15: *Dante's Advices at Farewell*

don't you agree?' *says Dante.*
'Of course, that is my eager hope,'
confesses the dreamer. 'As you admit it, 33
I must warn you that
you may face formidable
animosities of the overwhelming majority 36
of peoples who uphold
their traditional faiths and opinions;
I am concerned that they would prosecute you 39
for blasphemy and destroy
all your works. Are you aware of such
grave perils?' *says Dante.* 'I appreciate 42
your thoughtful, wise, and kind
advice, Dante. I am aware of how
awful and shameless things happened in history. 45

Song 15: *Dante's Advices at Farewell*

But my only and utmost
concern is how to write down what
I feel, think, imagine, and hope in honest, 48
plain words ere I perish
back to the void. I cannot afford
to worry about what other people would 51
think about me and my work
yet to be born through hard gestation.
Please pray to your God, Dante, to bless me 54
in completing my heartfelt
Hymn to the Sacred Conscience of Human,
entreats the dreamer. 'I will pray to my God 57
for you that your poem
will come forth into the light
for the inner awakening of humanity!' 60

Song 15: Dante's Advices at Farewell

says Dante in solemnity.

'I shall devote all my life to
fulfil it, even if it is merely a dream, 63
fleeting in my frail brain,'

says the elated dreamer resolutely.

'It is the most meaningful way for us to live. 66

Remember that we all
are dreamers in our own private
fantasies: I have believed that our Earth 69
were the very centre

of the Universe; all stars revolved
around it for us to watch the cosmic drama. 72

My faith in God as
the omnipotent and omniscient
creator and ruler of our world may be 75

Song 15: *Dante's Advices at Farewell*

a sacred dream that I
uphold with all my heart and soul.
You think that you are awake in the real world. 78
But you have been dreaming,
in fact, as if you were conversing
with a *Dante*, all made up by your lush 81
imaginations; this "*Dante*"
is nothing but a mere fleeting shade
in your subtle dream of this strange coming 84
upon by chance in your fertile
imaginations. Steer well in your journey
of life. Sing what your conscience feels deep 87
in you with lucid reason,
earnest devotion, and creative
imaginations! "*Dante-pilgrim*" will walk with you 90

Song 15: *Dante's Advices at Farewell*

through your “*inner journey*,”
“*Dante-poet*” will sing with you
in your poem. Neither strive to measure space 93
nor to count time; you are
in them, they in your mind. All things
inhere in each other. Flow freely into 96
infinity and eternity!’
Thus bids Dante his heartfelt farewell
to the dreamer. He tries to say what he feels 99
deep in his heart, sobbing
in sorrow and strange elation.
But no word comes out his overwhelmed heart. 102
Suddenly, the dreamer
wakes up from his numinous dream.
He grasps his pen and begins to write down 105

Song 15: Dante's Advices at Farewell

what he has conversed with
his revered and beloved poet
Dante in his dream, lest it fades away 108
from the fleeting memory
of the ephemeral yet creative
brain of the Homo sapience which happened 111
to evolve on this tiny
planet Earth in the mysterious
drama of the immense Universe. 114

The END

Epilogue

[A] The conversations between the character, '*Dante*' and the character '*dreamer*' in this work are mere fictional imaginations. Nonetheless, the author has tried them to be based on relevant scientific discoveries to the best of his ability, although they are incomplete and provisional.

[B] The author hopes that the present fictional narrative is readable by any sincere readers to grasp the gist of each '*song*' without professional trainings in modern science such as elementary particle physics and cosmology.

All technical terms used in this work are indicated by quotation marks in italics (e.g., "*fermion*," "*boson*," "*Big Bang*," "*annihilation of matter*," "*pair-production*," etc.). The author checked the accuracy of each term by consulting the online encyclopedia: [**www.wikipedia.org**](http://www.wikipedia.org). He wishes to thank Wikipedia for providing humanity with invaluable intellectual resources. As for expert explanations of the technical terms used in this work and their relevant references, please consult: [**www.wikipedia.org**](http://www.wikipedia.org).

[C] The following books nurtured the author to learn the essential basics of the relevant topics which are sketched in *'Mystery of the Universe:'*

(C-1). Books on physics

The Feynman Lectures on Physics by Feynman, R. P., Leighton, R., and Sands, M. (1964). 3 Volumes, California Institute of Technology.

Nonequilibrium Thermodynamics in Biophysics by Katchalsky, A. and Curran, P. F. (1965). Harvard University Press

Quantum Mechanics by Schiff, L. I. (1955). McGraw Hill.

The Nature of Physical Theory by Bridgman, P. W. (1936). Dover Publication.

Introduction to Mathematical Thought by Stabler, E. R. (1953). Addison-Wesley.

The Principia, Mathematical principles of natural philosophy by Newton, Isaac (1687- 1726). A new translation by Cohen, I.B. and Whitman, A. (1999). University of California Press.

(C-2). Books on Astronomy and Cosmology

Coming of Age in the Milky Way by Ferris, T. (2003).
Harper.

A Brief History of Time by Hawking, S. (1988).
Bantam Dell

The Universe in a Nutshell by Hawking, S. (2001).
Bantam Dell.

The Cosmic Landscape by Susskind, L. (2006).
Little, Brown & Co.

Time's Arrow and Archimedes' Point by Price, H
(1996). Oxford University Press.

Critique of Pure Reason by Kant, Immanuel (1787),
Translated by Smith, N. K. (1929). MacMillan Ltd.

[D] The **Song 14: *Hymn to the Sacred Conscience of Human*** was inspired by *The Iliad* and *The Odyssey* of Homer and other later epics about the Trojan War. The episodes in this fictional narrative are based on the following classic texts in English translations:

(D-1). *The Iliad of Homer*. Translated by Murray, A. (1924), Loeb Classical Library, Harvard University Press.

The Iliad of Homer. Translated by Lattimore, R. (1951), University of Chicago Press.

The Iliad of Homer. Translated by Fagles, R. (1990), Penguin Books.

(D-2). *The Odyssey of Homer*. Translated by Murray, A. (1919), Loeb Classical Library, Harvard University Press.

The Odyssey of Homer. Translated by Fitzgerald, R. (1961), Doubleday & Company.

The Odyssey of Homer. Translated by Fagles, R. (1996), Penguin Books.

(D-3). *Hesiod, The Homeric Hymns and Homeric*.

Translated by Evelyn-White, H. G. (1914), Loeb Classical Library, Harvard University Press.

[E] The present narrative poem is written in the syllabic tercet stanza. This is not a traditional English poem with the proper accentual prosody. Nevertheless, this strange syllabic writing is what its author could try best in his pidgin English to sing of the lofty ideas and sublime spirit of his revered classical poets who have inspired and nurtured him.

[F] The author wishes to acknowledge deep inspirations and decisive influences by *The Divine Comedy* of Dante (1265 – 1321). The terza rima of *La Commedia* has inspired him to adopt a simpler form of the tercet stanzas in his humble works from the following classic text in English translations:

(F-1). *La Divina Commedia* of Dante Alighieri.
Edited and annotated by Grandgent, C.H., Revised by Singleton, C. S. (1972), Harvard University Press.
The Divine Comedy of Dante. Translated by Singleton, C. S. (1970-80), Princeton University Press.
The Divine Comedy of Dante. Translated by Bickersteth, G. L. (1981), Basil Blackwell, Oxford.
The Divine Comedy of Dante. Translated by White, L. G. (1948), Pantheon Books, New York.
The Comedy of Dante Alighieri (1962), Translated by Sayers, D. L. and Reynolds, B., Penguin Books.

(F-2). *La Vita Nuova (The New Life)* of Dante.
Translated by Rossetti, D. G.: Reprinted in *The Portable Dante*, edited by P. Milano (1969). Penguin Books.

The sublime spirituality, the beauty of the exquisite poetic form, and the deeply moving music of *La Commedia* of Dante are high above far beyond his reach.
Yet, they inspire him like the mysterious spiritual stars shining in his inner heaven.

[G] The author confesses that his daydreaming with Dante completes in this work through ineffable inner travails over three decades of gestation. He wishes to acknowledge that the profoundly moving '*Pietas*' and '*Drawings*' of Michelangelo Buonarroti (1475-1564) and the soul-searching '*Missa Solemnis*' and '*Late String Quartets*' of Ludwig van Beethoven (1770 -1827) have sustained him to overcome despairs, agonies, and temptations in the journey of our life.

Art Aeon

